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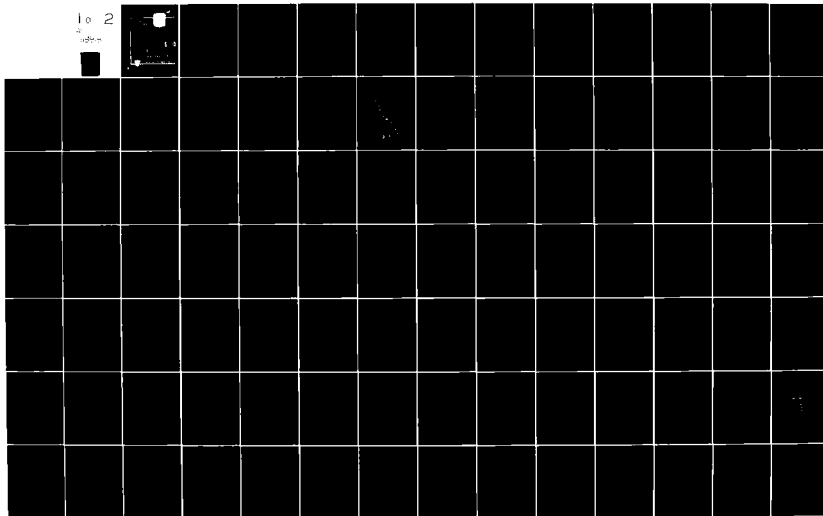
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JUNE 1982



EMPLOYMENT OF THE ENGINEER SYSTEM IN LIGHT CONTINGENCY CORPS OPERATIONS

by

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A118918	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Employment of the Engineer System in Light Contingency Corps Operations		5. TYPE OF REPORT & PERIOD COVERED Study Project
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) James A. Velezis, LTC Herbert F. Wickham, Colonel Gary G. Harber, LTC		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army War College Carlisle Barracks, PA 17013		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Same		12. REPORT DATE June 1982
		13. NUMBER OF PAGES 163
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This study was undertaken as an initial effort to investigate the employment of the Engineer System in Light Contingency Corps operations. This study focused on the northeast Asia contingency. It employs as a vehicle three different scenarios and attempts to address the employment of the Engineer System in each, as it influences mobility, countermobility, survivability, and general engineering tasks. The study contains considerable information and historical perspectives on the chosen area of operations (Korea). It provides some		

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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appreciation of the terrain, climate, people, transportation, and historically revisits the Korean War to learn or relearn old lessons. The special requirements for aviation support for command, control, and communications/supervision were also addressed. From this, it is hoped that stimulus for further and more detailed research be generated. Additionally, the need for a simple, but effective, prioritization scheme was explored and discussed.

USAWC MILITARY STUDIES PROGRAM PAPER

EMPLOYMENT OF THE ENGINEER SYSTEM IN LIGHT CONTINGENCY CORPS OPERATIONS

A GROUP STUDY PROJECT

by

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Date: June 1982

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Accession For	
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DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
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TITLE: Employment of the Engineer System in Light Contingency
Corps Operations

FORMAT: Group Study Project

DATE: June 1982

PAGES: 163

CLASSIFICATION: Unclassified

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PREFACE

This Group Study Project was produced under the sponsorship of the US Army War College - Military Studies Program. The genesis for the study came from a discussion with LTC (P) Paul G. Cerjan, initially the Faculty advisor for the Study Group. Upon LTC Cerjan's departure (early in the school year), however, the project was redirected from a southwest Asia to a northeast Asia orientation. This change of emphasis was encouraged and supported by the I Corps Engineer and the Director, Combat Development, US Army Engineer School. They both expressed the need to explore the employment of the Engineer System in support of Light Contingency Corps operations with a northeast Asia orientation.

The authors of this study were all members of the Class of 1982. COL Wickham is a Group Commander of a National Guard Engineer Group; LTC Harbor is an aviator (Technician) with the Tennessee National Guard; and LTC Velezis is an engineer in the Active Force.

The study effort initially focused on background reading, research, and attendance at several Engineer Commander's Conferences. Based upon these efforts, the authors defined the scope, direction, and format for the study. Because of the limited scope, no attempt was made to discuss any detailed requirements for force structure, equipment, or actual operational deployments.

To complete the study, the authors visited and held extensive discussions with personnel at various organizations and agencies in CONUS and OCONUS. At each of our stops, we were met with professionalism, friendship, encouragement, and imbued with a sense of reality. We thank all those that gave freely of their time, guidance, knowledge, and patience. Their contributions were invaluable as they provided meaningful input to the study. We also thank the members of our families who had to endure all the frustrations along with us.

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CHAPTER I

INTRODUCTION

Purpose

This study was undertaken as an initial effort to investigate the capability of a Light Contingency Corps and, in particular, the engineer effort required to support and enhance that capability. The recently established Light Contingency Corps is still in its formative stages and their assessment of the mission and concept of the type of operations they will conduct in a fast-moving contingency will impact on the type engineer units and equipment needed to support those missions. The main effort of this study is focused in that direction. The special requirements for aviation support for command, control, and communications/supervision, and rapid redistribution of critical engineer equipment within the area of operations will also be addressed.

Objectives

The objectives of this study are:

- To provide a better understanding of the following concerns which confront planners when considering engineer requirements for support of tactical units involved in fast-moving contingency operations around the globe:
 - Actual area of operations.
 - Type of tactical operations to be conducted.

- Impact of mobility mismatch between engineers and units supported.
- Engineer equipment deployability and transportability constraints.
- Command relationships in a fluid combat environment.
- Availability of aviation support for the engineer system.
- To assess impacts of these concerns on force structure capabilities of engineer units.
- To identify issues requiring further study.

If this study can shed any appreciable light on these concerns, the time and effort will have been well spent. In a world in a constant state of flux in which timely response to unforeseen events may be in America's best interest, it is necessary to seek answers to the concerns addressed . . . or perhaps discovered . . . by this study.

General Approach

The study effort initially focused on background reading and research, interviews and visits to the U.S. Army Engineer School at Ft. Belvoir, Virginia, attendance at several Engineer Commanders' Conferences in the Washington, D.C. area, and discussions with the appropriate Department of the Army (DA) Staff elements. Based upon the results of this initial effort and the stated desires of the Contingency Corps Engineer, the authors defined the scope of this study and focused their orientation on northeast Asia as the area of operations. Our research revealed that extensive research and study had already been accomplished in addressing the engineer requirements for a NATO contingency.¹ Additionally, a recent (1981) U.S. Army War College study, "Employment of the Engineer System in Arid Mountainous and

Desert Areas - - A Concept Paper,"² outlined general employment considerations of the engineer system in arid mountainous and desert terrain of the Mediterranean basin and the horn of the east Africa area. Our research found lack of any detailed or comprehensive studies dealing with the employment of the Engineer System in the northeast Asia environment since the end of the Korean War. For the reasons stated above, the authors consented to the Contingency Corps Engineer's request to focus this study on that part of the globe. The scenarios to be discussed later in this report, however, are considered to be applicable to any region.

To complete their assessment, the authors visited and held extensive interviews and discussions with personnel at: I Corps, Ft. Lewis, Washington; Combined Forces Command (CFC), Eighth U.S. Army, Eighth U.S. Army Engineer, 2nd Engineer Group, Seoul, Korea; 44th Engineer Battalion (C) (H), Camp Mercer, Korea; PACOM, WESTCOM, 65th Engineer Battalion (C), 84th Engineer Battalion (C) (H), and 29th Engineer Battalion (Topographic), Hawaii. Additionally, the authors conducted a hasty road recon of representative terrain during their visit to Korea. These visits and discussions were invaluable as they provided meaningful input to the study and to the analysis of the issues.

Tactical Mission Considerations

Further research revealed a wealth of information on the employment of engineers during the Korean Conflict in the variety of combat operations addressed in this report. Additionally, our research quickly led us to the conclusion that the time and effort available for this

study were limited. Therefore, by necessity, the scope of the study had to be limited. The core of this report will address the employment of the Engineer System in Light Contingency Corps operations - supporting the following three type tactical missions. These were selected as the most probable (not the only ones) missions to be assigned to the Light Contingency Corps for any of the likely contingency areas around the globe:

1. Forward Defense Reinforcement. Given adequate strategic warning the Contingency Corps can be deployed as a reinforcing force to the forward deployed forces, i.e. NATO reinforcement in Central Europe or Korea.
2. Reinforcement to Restore Boundaries. If adequate strategic warning is not possible and the enemy has effected some penetration or breakthrough, the Contingency Corps may be deployed as a reinforcing force to assist in restoring the original boundaries.
3. Air Land Battle - Offensive Maneuver Operation. Depending on the amount of strategic warning, the Contingency Corps could be deployed as either a reinforcing force or as a counterattack force to assist forward deployed forces in executing offensive operations in accordance with the recently adopted offensive maneuver doctrine.

As mentioned above, the bulk of the report deals with the employment of the Engineer System. To provide a common base and point of reference, we define the Engineer System as shown in Figure 1. For complete details we refer you to FM 5-100, Engineer Combat Operations.³

Study Format

After considerable thought and discussion, the authors selected the following format to address the stated objectives of the study:

- I. Introduction
- II. Assumptions
- III. Historical Perspective
- IV. Tactical Scenarios

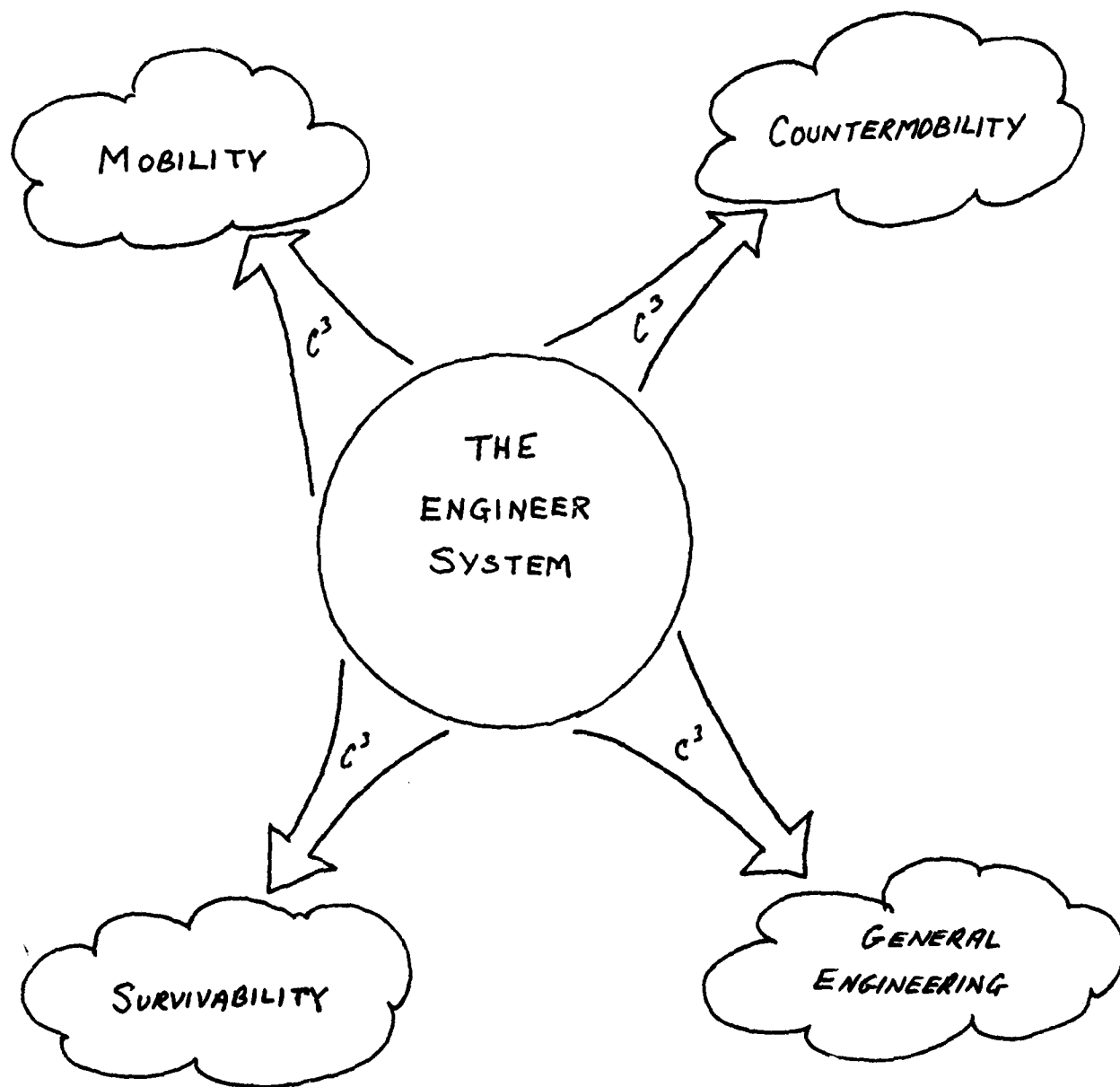


FIGURE 1

- A. Forward Defense Reinforcement
 - Mobility
 - Countermobility
 - Survivability
 - General Engineering
- B. Reinforcement to Restore Original Boundaries
 - Mobility
 - Countermobility
 - Survivability
 - General Engineering
- C. Air Land Battle - Offensive Maneuver Operations
 - Mobility
 - Countermobility
 - Survivability
 - General Engineering
- D. Command, Control & Communications Considerations
- V. Summary and Conclusions
- VI. Additional Considerations

The following chapters detail the study approach and provide the information for analysis.

CHAPTER I

FOOTNOTES

1. U.S. Army Corps of Engineers, Engineer Studies Center (ESC), U.S. Army Engineer Assessment, Europe, (SECRET-NOFORN), June 1981.

2. Cerjan, Paul G., Lieutenant Colonel (P) and Stroup, Theodore G., Lieutenant Colonel (P), "Employment of the Engineer System in Arid Mountainous and Desert Areas--A Concept Paper," U.S. Army War College Study Project, August 1981.

3. U.S. Department of the Army. Field Manual 5-100: Engineer Combat Operations. 30 March 1979. (Referred to as "FM 5-100" hereafter.)

CHAPTER II

ASSUMPTIONS

The following assumptions are considered to be operative during the remaining discussion, narrative and analysis:

1. New offensive doctrine espoused in revised FM 100-5¹ is adopted and incorporated into appropriate contingency plans.
2. Deployment schedules for the Contingency Corps are executed IAW approved Time Phased Force Deployment List (TPFDL).
3. Forward Defense will not change as a strategic concept.
4. OPLAN 5027 is exercised for the benefit of this study.
5. Current resource constraints remain fairly constant during the foreseeable future.
6. The Contingency Corps is fully deployed and not piecemealed into the tactical theater of operations.
7. Host Nation Support agreements have been negotiated and are fully operative.
8. Perspective enemy will employ Soviet tactics and possess comparable weapon capabilities.
9. Technological development changes affecting the performance of military engineering will continue to be evolutionary.
10. Nuclear and chemical weapons will not be used in the selected area of operations.

CHAPTER II

FOOTNOTES

1. U.S. Army Command and General Staff College. Field Manual 100-5: Operations. Final Draft. 15 January 1982. (Referred to as "FM 100-5" hereafter.)

CHAPTER III

HISTORICAL PERSPECTIVE

Throughout history wars have been unceasing; yet, strange to relate, statesmen, upon whom the main burden of the conduct of war falls, have paid only passing attention to the records of the past. That is the ignorance of history which does so, with the result that identical blunders recur in every age . . . if the present is to profit from the past, only from a study of former periods in which the prevailing conditions resemble those of the present are profitable lessons likely to be found.

J.F.C. Fuller
Major General

General Fuller's statement on the importance of historical "lessons learned" is not novel. Many others had said it before him, but his advise remains valid today. Our research revealed that very little has been written concerning the employment of the Engineer System to support combat operations in the Korean Peninsula since the end of the Korean War. Only two ^{2,3} studies addressing mine/countermine and barrier plans have been conducted since the mid-fifties. The purpose of this chapter is to revisit the Korean War and provide some insights on the use of engineers during that conflict, and to assess the present utility of some of the "lessons learned" under the fog of combat.

Impact of Geography

Frederick the Great once stated that, "Knowledge of the country is to a general what a musket is to an infantryman and what the rules of arithmetic to a geometrician. If he does not know the country, he

will do nothing but make grave mistakes."⁴ Strategic military masters manipulate the physical environment, exploit its strengths, evade its weaknesses, acknowledge constraints, and contrive always to make nature work for them, instead of against them. As our forces found during the Korean War, geography, terrain and climate of the Korean Peninsula presented formidable obstacles to tactical operations. The following information is offered to shed some light on the selected area of operations in the hope that the "grave mistakes" alluded to above can be avoided.

The history of Korea has been molded greatly by her geographical position in East Asia. Her geographical position astride a main cross-road of trade, war and culture has shaped her past, present and, with all probability, her future. "Her pivotal position has made her the political, military and cultural avenue from continental northeast Asia to the islands of Japan, and from the islands to the continent. On the flank of any major continental power, her cooperation or control was deemed essential to their security. Thus in northeast Asia, Korea has been the nexus in the power relationships between north and south, between east and west."⁵ Based on her pivotal geographic location and her ascendancy as an economic and military power in that region, Korea will continue to be the nexus of northeast Asia power relationships having global implications.

Location. The Korean peninsula is approximately 550 miles in total north-south length while its east-west width varies from 125 to 200 miles (see map in Figure 2). It is separated from Manchuria and the Soviet Union to the north by the Yalu and Tumen Rivers and the Baegdu

KOREA

LEGEND

- Main road —————
- Railroad —+—+—+—
- River ~~~~~
- Capital ●
- Town •

mountain range. The Yalu River flows southwest and empties into the Yellow Sea, and the Tumen River first flows northeast and then southeast, emptying into the East Sea (Sea of Japan). The shortest distance between Korea and Japan is 125 miles, and it is about 115 miles to the Shantung Peninsula in China to the west.⁶

In overall size (about 85,200 square miles), Korea is approximately equivalent to Great Britain or the state of New York. It is currently divided into two parts - Communist North Korea (Democratic People's Republic of Korea) composing about 55 percent of the area, and free South Korea (the Republic of Korea) comprising the other 45 percent, about the same area as Iceland or Portugal.⁷

Land Forms. Korea is geomorphologically characterized by abundant hills and mountains, which occupy nearly 70 percent of its territory. The low hills in the south and west give way gradually to increasingly higher mountains to the east and the north. Generally, the western and southern slopes of the Korean Peninsula are very gentle with various types of plains, low hills, and basins developed along the rivers, while the eastern slope is very steep with no significant rivers or plains, because high mountains are very close to the coast.

Korean mountains form ranges in two major directions. The T'aebaek and Nangnim mountain ranges (approximately 5,000 to 7,000 ft.) are of a north-to-south direction and constitute the drainage divide between the western and eastern slopes. The T'aebaek mountains that run very closely parallel to the east coast are a southward extension of the Nangnim mountains. They have various spectacular land forms carved out of granitic rocks - a series of rocky pinnacles piercing the sky; deep and narrow canyons bordered by nearly vertical granite walls;

various well-developed joint systems shown in the valleys in terms of blocks of rock; and numerous waterfalls and rapids along the streams. The two mountain ranges, however, have been a great barrier to communications between the eastern and the western sides of the peninsula.

In northern and northeastern Korea, the Kangnam, the Chogyu, the Myohyang, the Myorak, and the Hamgyong mountains are smaller tributary ranges and spurs, originating in the Nangnim - T'aebaek Mountains, and run generally parallel to each other in the northeast-southwest direction. The Sobaek mountains (about 6,000 feet - highest elevation) of southern Korea also have their roots in the backbone mountains and run in a generally northeast-southwest direction. These mountains have historically obstructed free intercourse between the central and the southern regions and also between the eastern and western districts in southern Korea.

The soils of the lowlands as well as the mountain areas are usually brownish with some variations according to bedrock. Most soils are derived from granite and gneiss, with limestone and volcanic rocks in limited areas. Light brown and sandy acid soils are common in the soils derived from granite, and clayey brown to red soils are common in the granitic gneiss areas. In the northern mountain areas podzolic soils, ash-gray forest soils, are found. Most cultivated soils, such as the paddy soils, are artificial soils developed through plowing, irrigation, and fertilizing over long periods. Settling of silt from irrigation water and occasional flooding of rivers have changed the soil composition from its original character in many areas to a uniform silty loam unrelated to the natural soils of the vicinity.⁸ During the monsoon season, most of these soils turn into muddy quagmires impeding cross-

country mobility and trafficability on the many unimproved and unsurfaced roads.

Korea has a much-indented coastline - about 10,400 miles in total length. The east coast is rocky and rugged, with a tidal fall of only 2 feet. There are few good harbors other than Wonsan and Cheongjin in the north. The west coast is low and much indented, characterized by broad mud flats, and has a tidal fall of from 20 to 33 feet. The major harbor is Inchon, with the second highest tidal movement (water level difference of 33 feet) in the world. Other good harbors include Kunsan, Mogpo, and to the south, Pusan, the largest and most important port in south Korea. Korea also has a total of some 3,300 offshore islands, large and small. Of these, only 200 are of habitable size.

Rivers. The rivers are mostly shallow, short, and swift, because of the prevalence of mountains and the relative narrowness of the peninsula. The Yalu River (Amnok) and the Tumen River are the longest in the north, forming the borders with China and the Soviet Union, and drain into the Yellow Sea and East Sea respectively. Other rivers of significance in the north are the Ch'ongch'on River, the Taedong River, the Nam River, the Yesong River, and the Imjin River, all flowing into the Yellow Sea. Major rivers in south Korea are the Han River, the Nakdong River, the Kum River, and the Imjin River. All flow into the Yellow Sea, except the Nakdong which flows into the South Sea. There are also many rushing mountain streams which must be considered during the rainy season. They do become obstacles to fluid movements of tactical formations.⁹ To be elaborated on later.

Climate. Although within approximately the same latitude as San Francisco, Wichita, and Philadelphia, Korea's climate is more extreme,

especially during the bitterly cold winter months. The mean temperature during winter is generally below freezing.

Summers in Korea are hot (averaging between 83° and 88° F) and rainy. The summer begins in June and lasts for four months. The summer monsoons bring abundant moisture and produces heavy rainfalls. About 70 percent of the annual rainfall comes during June through September. During the summer rainy season, rivers and streams throughout Korea are filled with run-off water from the upper streams which often cause floods. There is very little difference between north and south in summer temperature. Temperature differences are greater between the coast and inland than between north and south.

The winter in Korea is long, lasting about six months in the northern interior and about four months in central and southern Korea. It is during the winter that the climate contrast between northern and southern Korea is most apparent. The temperature differential varies between minus 40°F in the north and a few degrees below freezing in the south. Most rivers in north Korea are frozen over for several months during winter. The winter monsoon which originates in the interior of the Asian continent is dry and low in temperature. The winter monsoon produces less than 10 percent of the total annual precipitation, mostly as winter snowfalls.¹⁰

Transportation. Transportation and lines of communication in Korea, especially south Korea, have improved significantly since the Korean War, when "the roads were scarcely more than narrow trails winding through the mountains or following the dried-up river beds."¹¹

Based on the latest available information, north Korea has a total of 2,850 miles of railroads; 12,200 miles of roads; 98.5 percent of which

are gravel, crushed stone or earth surface, and only 1.5 percent concrete or bituminous; 1,350 miles of navigable inland waterways (small craft only); and they have six major and 26 minor ports.¹²

In south Korea remarkable progress has been made in all areas of transportation during the last three decades. South Korea currently possesses a total of 47,900 miles of highways and roads, 45 percent of which are surfaced; 10 major and 18 minor ports; 35 major commercial aircraft airfields; 113 usable airfields - 55 of which have permanent surface runways;¹³ and 3,400 miles of railroads. Commercial air transportation has also improved significantly. The Korean national flag carrier, Korean Air Lines (KAL), now serves 18 air traffic centers of the world: has a fleet of 28 aircraft, including six Boeing 747 jumbo jets, four DC-10's and six A-300B European-made airbuses.¹⁴

Population. Koreans are descendants of several Mongoloid tribal groups which migrated from the north (present Manchuria) in prehistoric times. They, however, were early fused into a separate, homogeneous race, independent of their neighbors, with traits distinctive from both the Chinese and Japanese. They all speak, understand, and write the same language. As of January 1981, north Korea had a population of 19,627,000, with an average annual growth rate of 3.2 percent, and south Korea had a population of 40,098,000, with a growth rate of 1.6 percent.¹⁵

Although economic growth and industrialization have accelerated urbanization in Korea, the rural population still remains a large proportion (slightly less than 50 percent) of the total population. Rural villages are generally located along the southern foothills.

"Traditionally, geomancy or divining used to have a hand in the selection

of the site for a village or an individual house. It was believed that an ideal site for a house or village must have a hill behind it and a stream in front. But of course modern science will also recommend the southern foot of a hill as a likely place to build a home or village in a country where stinging winds are from the north or northwest."¹⁶

As commanders and military planners it is important that we heed Frederick's advise (referenced above). We must become cognizant of and seriously consider the many factors discussed above for any planned tactical operations focused on the Korean peninsula. History constantly reminds us of their importance and the consequences of failing to consider them.

Korean War Revisited

Before we discuss some of the achievements and challenges of the military engineer during the Korean War, it will be helpful if we review the sequence of military operations of that conflict. A sequential flow of the most important military operations is graphically displayed in Figure 3.¹⁷ In sequence, the main phases of the war were:^{18,19}

Outbreak of the War (25 June to 13 July 1950). North Korean (NK) troops crossed the 38th parallel in the early morning of 25 June 1950. The attack was unexpected and caught the South Koreans by surprise. The invaders were able to move swiftly and with little opposition, and by 13 July had overrun half of South Korea. Task Force Smith (21st Infantry Regiment, 24th Division) made the initial contact with the enemy on 5 July near Osan, 30 miles south of Seoul. It essentially fought delaying actions as the North Koreans pushed south.

MAJOR MILITARY MOVEMENT, KOREA JUNE 1950 - JULY 1953

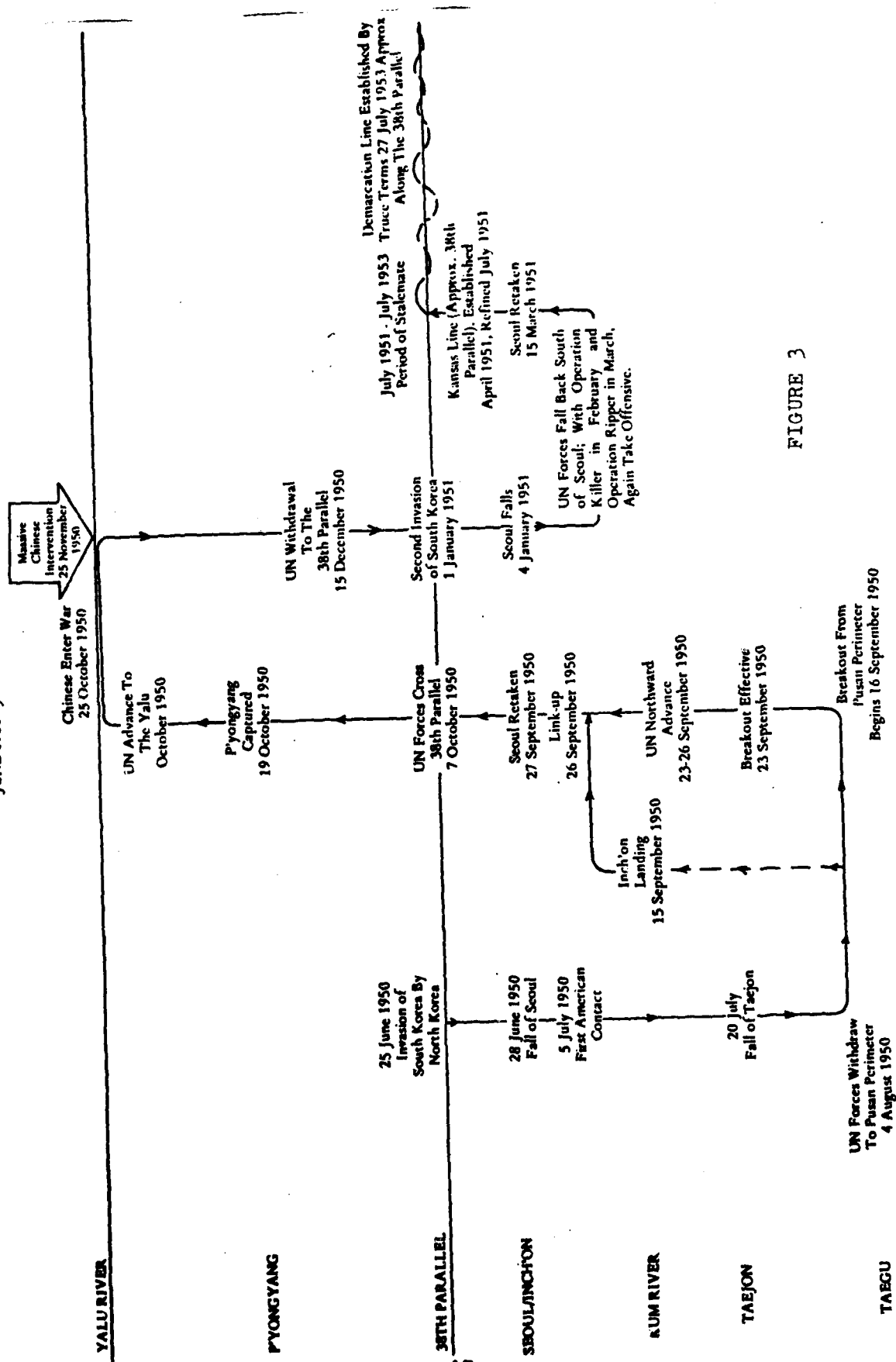


FIGURE 3

Pusan Perimeter (14 July to 14 September 1950). The United Nations (UN) forces made a stand at the Han River, the Kum River, at the town of Taejon and other points. Despite determined resistance, however, the stronger NK forces pushed forward and these points had to be relinquished one by one. On 1 August 1950, the UN forces called for a planned withdrawal of all their ground forces beyond the Naktong River. This established the positions identified as the Pusan Perimeter which marked the fixing of a continuous line of troops for the first time in the war. During the next six weeks the UN forces alternated between defense and counter attack - principally a holding action against almost daily onslaughts by the enemy while reinforcing men, materiel, and resources were being brought into the peninsular foothold.

South Korea Cleared (15-30 September 1950). While the Eighth U.S. Army-Korea was fighting the battle of the Pusan Perimeter, General MacArthur was planning the amphibious landing at Inchon to cut the NK line of communications deep behind their front lines. With the Inchon landing 15 September 1950, and the explosive breakout from the perimeter by the Eighth Army, UN forces cleared South Korea of the enemy by the end of September.

Drive to the North (1 October to 25 November 1950). On 6 October 1950, UN forces were given authority to pursue the enemy across the 38th parallel and to destroy them. The UN forces pursued the demoralized North Korean Army, and by 19 October, I Corps had entered Pyongyang. By the end of October the North Korean Army had dissolved; 135,000 prisoners had been taken. At the end of October and early November, however, ^{the Chinese} entered the battle and began to strike overextended UN units. The Chinese did not pursue their initial successes until

25 November 1950, causing an abrupt change to the complexion of the war.

United Nations Retreat (25 November 1950 to 24 January 1951).

On 25 November 1950, an estimated 180,000 Chinese Communists struck the UN forces. Most units held briefly but the Republic of Korea (ROK) divisions on the right were crushed and the Chinese swept over them in a threatening encircling movement. A few days later U.S. forces were threatened with encirclement. The Eighth Army fought withdrawal actions back to roughly the 38th parallel. The X Corps fought its way to Wonsan and Hungnam and evacuated by sea. The UN forces had scarcely established themselves along the 38th parallel before the Communists began a second invasion on South Korea on 1 January 1951. During the New Year's offensive, the Chinese captured Seoul on 4 January and Wonju by mid-month. The enemy offensive began to run out of steam, and by the end of January, UN forces were ready to assume the offensive once again.

United Nations Offensive (25 January to 21 April 1951). On 25 January, General Ridgway began a "limited advance along a solid front developed from a reconnaissance in force into full scale attack." UN forces took Inchon on 10 February and recaptured Wonju. They were probing northward when the enemy reacted and bent the line back. By 19 February, UN forces were again advancing as enemy pressure relaxed. UN forces retook Seoul by 15 March and continued their advance north of the 38th parallel virtually unopposed.

Chinese Spring Offensive (22 April to 19 May 1951). In the early hours of 22 April, the Chinese began their Spring Offensive and on 26 April made strong attacks against Seoul. UN forces again found themselves withdrawing south of the 38th parallel. They brought full force of artillery and air on the enemy and were able to stabilize the

front. By 19 May the enemy was once again at a standstill, and the UN prepared to go on the offensive.

United Nations Counter Offensive (20 May to 23 June 1951). UN forces encountered light resistance and by mid-June, the Eighth Army had regained the terrain it had lost during the Chinese offensive of April and May. As the first year of conflict drew to a close, the fighting diminished, and the Korean War appeared to have become a stalemate and a gradual shift from military action to political negotiation took place.

Lull and Flare-UP (24 June to 11 November 1951). President Truman authorized General Ridgway to negotiate with the enemy military command. Meetings began on 10 July with the understanding that hostilities were to continue until the armistice was signed. Although neither side wished all out warfare while the peacetalks progressed, and the fighting decreased in intensity, the Battle of Bloody Ridge and the Battle of Heartbreak Ridge were fought during this period.

Stalemate (12 November 1951 to 27 July 1953). On 12 November UN forces were ordered to cease offensive operations. Military actions afterwards developed into raids, combat patrols, limited local attacks, and artillery interdiction. Sharp skirmishes continued and the enemy stepped up action to erase bulges in the front as negotiations reached their decisive phase. Negotiations were completed on 19 July, and the Armistice to end hostilities of warfare that had ravaged the peninsula for 37 months was signed on 27 July 1953. The war was over but the true objectives for the war remain unsatisfied. Let's hope that history is kind and does not repeat itself!

Engineers in Korea - A Historical Perspective

The information presented below is a collage of actual operations and accounts as reported by engineers who participated in the Korean War. They are selective in nature and therefore not intended to be all inclusive. The intent here is to provide a panoply of actual engineer missions, performed under a variety of combat situations, which we as engineers may be called upon to do again in the future. Perhaps we may relearn some field expedients that served our predecessors well and may spell the difference in some future battlefield.

View From the Top. Colonel Pachal N. Strong, the Eighth Army Engineer from the beginning of the Korean War, provides us with some vivid accounts of engineers in action:

During the perimeter (Pusan) fighting, in August and September, our engineer troops consisted, with minor exceptions, of merely the division engineers and a half-strength combat battalion. So desperate was the need of the Army Commander for reserves that the division engineers were used repeatedly as infantry battalions, sometimes constituting task forces with artillery and tanks attached; sometimes, indeed, constituting the final reserve for the Army. Their engineer equipment was stored in the rear, and like the roving center of a football team, they dashed here and there, plugging up holes as they occurred. At no time or place in our history have the engineers of an Army more richly earned the title: Combat Engineers.

Our half-strength battalion was in combat reserve, but we were not destitute. We had a treadway bridge company, a dump-truck company, and a water supply company, organized into a composite battalion, and to this day our troops are using roads and bridges built by that unorthodox combination.

The breakout from the perimeter . . . demanded quick pursuit, yet many of the major highway and railway bridges had been destroyed, either by our troops or by the Air Force . . . It was apparent that if we were to keep the railroad pushed up within railhead

distance of our rapidly advancing troops, we must throw the book away . . . We had inadequate engineer troops and our engineer material, pitifully inadequate . . . We spliced pile on pile. We move trusses from one bridge to another. We built towering piers of sandbags and crossties. We and the Koreans were stretched out over 200 miles of railroads, but . . . seventeen days after we started work on the first bridge, the rail was through to Seoul. A week later it was across the wide, and deep Han River, on sandbag piers and into Seoul.²⁰

The Reds had begun a low level "shoofly" bridge across the Han by building sandbag piers in water as deep as 20 feet, but had abandoned the effort, doubtless because of the excessive erosion of the piers by the swift tidal currents. Little piling was available at the moment; the engineers took a deep breath and decided to build a low level bridge on the remains of the sandbag piers. These piers constituted an effective dam across the river, and the intervals between them were in effect sluice gates. The piers were built up to grade and reinforced with heavy wire netting to keep the bags in place, and 150 feet of the long water gap was bridged with pile bents to provide a spillway for the river . . . Day after day, as the bridge progressed, we watched the swirling water chew at the piers, wondered what was going on at the base, and put the chaplain on a twenty-four hour shift. Within seven days the rail was across and the trains moved north of the Han, relieving²¹ the congestion which had interfered with supply.

To improve the mobility of the tactical units the engineers worked hard and used their ingenuity to overcome some major obstacles.

Colonel Strong relates some of those initiatives:

Twice that spring (1951) the enemy threw everything he had at us, but each time he was repulsed with heavy casualties. The engineers contributed in two ways to this. First, we embarked on an extensive system of defensive works. Secondly, by pushing our road and bridge work, we established a system of lateral communications through the mountains, which enabled our reserves to be switched rapidly for counter action. Thus, when the Reds cracked our East Central front in May and poured through to disorganize our rear, they

were astounded to find themselves facing the Third Division, a division which they had known to be 100 miles away only the day before. The enemy was thrown back in a battle that cost them two divisions and broke the backbone of their offensive.

In the steep mountains of Central Korea, where the roads could not be built in time to reach the high ridges where our soldiers fought, we built cableways to supply them. We blasted our access roads for the artillery, knowing that such roads would only be used a short time. And always we remembered the coming floods and worked incessantly to make the main supply routes invulnerable to the raging torrents.

As in other wars, the engineers in the Korean War were called upon to destroy those very same structures that they had so painfully and proudly constructed a short time earlier. And then there is the ultimate sacrifice all soldiers are prepared to make - their lives to save their friends. Again, Colonel Strong relates a poignant account of each:

By the middle of November (1950) we were at the broad river across from Pyongyang, and then began one of the most heartbreaking construction operations in Korea.

For three weeks, in punishing weather that reached 20 degrees below zero, the engineers had worked day and night to finish the 3,000 feet of pile trestle railroad bridge to enter Pyongyang, and on the day that the last steel beam was put in place, they were ordered to place demolition charges. The Chinese had struck.

The Second Division bore the brunt of the unexpected attack. But no unit of the Division was more badly hurt or gave a better account of itself than the Second Engineer Battalion. In an effort to hold the road open to permit the divisional artillery to get out, the Second Engineers were committed as a rear guard. They were hit on all sides. When they finally extricated themselves, half their officers and men were casualties, and all their equipment was gone.

Orders were to destroy every bridge and every culvert on railway and highway. The execution, by the Corps Engineers, was done so successfully that the Chinese Reds never made contact with our forces until we made a stand²³ at the Inchon River, 25 miles north of Seoul.

Colonel Strong concludes his narrative by summarizing some old lessons that were relearned. As we pursue our contingency planning, it's imperative that we inculcate these lessons to all who may someday find themselves facing the same challenges as our engineers did in Korea:

There have been engineer lessons learned in Korea, yes, but almost without exception they are old, time-honored lessons that must be learned over and over again by each generation of engineers. The old trinity of planning, organization, and supply is still the three-in-one godhead of all successful engineer operations. But along with that there are certain things which should be emphasized, because they are so easily forgotten in peacetime assignments.

First, pick the best man available for your supply division. Supply is 75 percent of any major job. Get a man who will not accept "no" from anyone and back him up.

Second, from the very beginning, plan to exploit to the full, native labor, native contractors, and native materials. It takes time to organize indigenous resources but in foreign lands you cannot do without them. Integrate them into your units to take full advantage of the construction potential of native units, using native methods.

Third, do not over-demolish facilities in terrain which your forces may occupy again. The importance of this cannot be overemphasized for it caused us so much unnecessary work in Korea. If you want to deny the use of a railroad to an enemy who holds it temporarily, you do not have to destroy every bridge along the line. Blow a few critical structures, and

you put hundreds of miles of railroad out of operation. This precept is so sound that one wonders why we did not carry it out in Korea. (commanders) There are two answers: first, the ground over-sensitive to the dangers of pursuing Reds, ordered the local engineers to blow up everything in sight . . . But even when you have indoctrinated your field commanders on demolition, there is still the problem of the Air Force . . . The difficulty is not one of Air Force policy but rather of indoctrination of the young pilots with the seriousness of over demolition. The sight of an undamaged railroad bridge a few thousand feet below him is just too much for a young pilot to bear, especially if he is returning from an abortive mission with a load of bombs. (Authors note: What this lesson points out is the need to establish command policy on what is to be destroyed, by whom, at whose orders and when. Although the lesson seems so obvious, we tend to violate it in every conflict.)

A fourth thing we learned was what to do with floating bridges in floods. We learned the hard way. At first, we tried to hold the bridges. The debris would sweep down from above, cables would snap, and a chain reaction would begin. The upstream bridge would go first and crash into one a few miles below. The resulting wreckage would speed downstream to the next bridge and so on. There is only one thing to do to a floating bridge in a flood. Get it out of the water, or swing it to one side and lash it with everything available. (Authors note: Although our bridging capability has improved [MAB and Ribbon Bridge] since the Korean War, this lesson may still apply under certain circumstances and thus should not be discounted.)

Another thing all echelons had to relearn was that nothing is gained and much is lost by working troops and officers to exhaustion. All rush construction jobs should be done using two or three shifts . . . this applies to everyone engaged in the work . . . An eager commander who drives himself to overfatigue can not plan correctly, think correctly, or act correctly.

Another thing we learned was that heavy engineer equipment, in spite of the difficulties of transporting it over the country, was worth every

bit of effort put into it . . . when the real engineer work began as we moved northward, when new roads had to be pioneered through the mountains, there was no acceptable substitute for the D-8 dozers and the heavier shovels. They certainly constituted mobile roadblocks as they lumbered from one job to another, but they were worth all of the transportation trouble they caused us.

And one final thing we learned was that in tight places every engineer soldier with a rifle was first a soldier and second an engineer. The moral is that combat engineers and their officers must never neglect their basic combat training. To do so is to invite disaster.²⁴

A Closer View

"Operation Bug-Out" was the irreverent name given by the G.I.'s to the retrograde movement which commenced with the withdrawal shortly after Thanksgiving Day, 1950, when the Chinese attacked, and ended six weeks later some 300 road miles to the south. Colonel Emerson C. Itschner, the Corps Engineer of I Corps operating in the western sector, provides the following account:

The change from the autumn offensive period to the withdrawal was abrupt. Engineer units found their primary mission changed overnight from one of aiding the United Nations troops to an equally important but less relished task of placing all possible obstacles in the way of the enemy . . . Engineer work fell generally into three categories:

1. Keeping at least one good route of withdrawal open for each Corps.

It was imperative that every one of the seven major rivers traversed by the route of withdrawal have at least two bridges in the Corps sector capable of supporting the heaviest loads . . . Most of the rivers had only one bridge, either a floating bridge of the modified treadway or the M-4 type, or a combination causeway-timber trestle bridge.

Many of the smaller streams were crossed on bypasses constructed around bridges. Most of these were mere fords, while others had been improved with low-level bridges. As soon as it became apparent that a withdrawal might be necessary, bypasses were constructed around intact bridges as well, having in mind the possibility that enemy or guerilla action might destroy them.

It is difficult to describe the extreme concern that the tactical commanders and their engineers had for the safety and adequacy of the road and river crossings behind them. The possibility existed continuously for six weeks that large numbers of vehicles would be isolated on the enemy side of a river and thus be captured. A heavy snowfall might so have delayed the thousands of vehicles streaming down the road . . . River ice, particularly where it was subjected to extreme tidal action, might destroy sections of pile or trestle bridges and wash away pontoon bridges . . . A heavy rainfall and thaw would have washed out and inundated many of the bypasses.

2. Executing demolitions to delay the enemy.

Even though greater importance was attached to the function of providing roads and bridges so that the Corps could withdraw intact, the principal effort of engineer units was devoted to the execution of demolitions, both to delay and impede the enemy and to prevent equipment and supplies from falling into their hands.

The principal problems involved in the demolition activity were to determine what to demolish, to what extent to destroy it, when to execute the demolition, and who should give the word to accomplish it . . . The ogre haunting every engineer commander assigned this type of work was his knowledge of two examples of the past: The German officer responsible for the destruction of the Remagen bridge across the Rhine was executed because he did not act soon enough, where the South Korean engineer responsible for demolishing the large permanent bridge across the Han River at Seoul, in the first

days of the war, died because he demolished the bridge too soon, before all units had crossed. Obviously, a nice sense of timing was required of the engineer engaged in demolition work, with severe penalty for poor judgment.

The heaviest concentration of demolition targets was, of course, in Pyongyang. Elsewhere, including Seoul, bridges composed the great majority of the targets. Almost every important bridge throughout the entire length of the withdrawal was destroyed.

3. Destroying all military equipment and supplies which might fall into the hands of the enemy.

In addition to demolition by engineers, other services demolished supplies that could not be evacuated. An ammunition dump was accidentally destroyed by fire a day early when a vehicle caught fire . . . The last deliberate demolition was the destruction of a large number of bombs at the airfield. They were set off by using an abundant supply of napalm.

Charges were calculated and placed in accordance with the manual. The effectiveness of the demolitions attested to the adequacy of standard demolition practices and doctrine. In order to conserve explosives, structures were burned when this method was considered likely to produce satisfactory results. Napalm was especially useful in burning timber bridges, supplies, and ammunition.

Were any changes to be made in demolition policy as a result of this experience, it would be in the direction of executing less extensive demolitions, so that when our forces return, as they did and always will, there would then be much less reconstruction required.

(Authors' note: The reader may find it useful to review the written instructions which were issued to units executing demolition missions referenced above. See Appendix 3.)

Bridging Challenges

During the initial retreat by the UN forces to the Pusan Perimeter and the subsequent retrograde withdrawal from North Korea, UN forces

destroyed practically every highway and railroad bridge in their path. For the engineers, who were instrumental in the destruction of many of these bridges, the UN counteroffensives presented many opportunities to use their ingenuity to repair and replace these bridges. A few examples will provide sufficient information and point out the valuable lessons that we should not have to relearn again.

With the buildup of the UN forces in the Pusan defense perimeter, and the landing at Inchon, the 3rd Engineer Combat Battalion, organic engineers of the 24th Division were directed to prepare to cross the 24th Division over the Naktong River in the vicinity of Waegwan. Plans were initiated to reconnoiter the crossing area, gather the necessary assault boats, and to coordinate with the infantry on the tactical employment of troops and equipment in the crossing.²⁶ "At one of the crossing sites there was very little opposition. At the other, resistance was stubborn and the Engineers, as well as the Infantry assault units, suffered many casualties. Boat operators demonstrated the same courage, resolution, and attention to duty that has built up a high tradition in the Corps of Engineers during our country's wars."²⁷

On 20 September, the floating bridge site was selected and cleared of enemy on the Naktong River. The river banks were 25 feet above the water surface and required considerable bulldozing in order to provide a place for offloading of the bridge components. "Through anxiety to get the bridge under construction, a serious error was made in not providing enough space to permit the trucks to back freely; also, the slope was left so steep that trucks could back to unload only with the greatest of difficulty. This factor alone later resulted in several

hours of lost time."²⁸ The floating bridge was completed and opened early in the morning of 22 September 1950, and the 24th Division poured across the Naktong River. Other crossings were made shortly thereafter north of Waegwan by the 1st Cavalry Division.

In early October 1950, the engineers were ordered to construct a bridge for heavy vehicles across the Kum River north of Taejon. The enemy unable to replace the blown bridge at the same site, had built a sandbag ford across the river. With this ford as a base, the engineers constructed a causeway-culvert combination with a 100 feet of floating treadway in the center to accommodate the flow of the river.²⁹ This was later often erroneously called the "underwater bridge."³⁰

An engineer captain provides some vivid commentary on the perils of bridging the treacherous Han River during the counteroffensive of February 1951:

Leading elements of the IX Corps were enabled to cross the Han and be supplied by the use of fords, a low-level bridge constructed of sandbag piers and native timber in the vicinity of Yoju, and the river ice which was 8 to 12 inches thick . . . An M-2 Treadway bridge was constructed near the existing sandbag-pier bridge . . . Both the sandbag-pier and the M-2 bridges had been located to fit the existing road net and the natural crossing site of the Han River on the Yoju-Wonju road.

Just before noon on February 21 the first rain of 1951 began to fall. In addition, several inches of snow over all the river watershed melted and the ground began to thaw as the rain fell. The engineers were ordered to . . . place a far shore trestle in the M-2 bridge to accommodate an unexpected rise of 2 feet in the river. Concurrently, demolition crews began blasting the ice to clear a lane for the ferries across the river. By 8 p.m. the ferries were completed and in position. At midnight it was still raining and the river had risen by .6 feet to a level of 5.4 feet.

With the rise of the river, the thick ice began to break up. At 2:30 a.m. on February 22, when rain stopped, some 2 inches of rain had fallen during the 16 hours. The river rising steadily at the rate of .15 feet per hour, reached a crest of 8.9 feet during the afternoon. The normal stream velocity of 5 to 7 feet had increased greatly as the large ice jam began to form behind the sandbag bridge. And the floating ice was pounding the floating bridge.

By 3 p.m. the approach to the sandbag bridge had been washed out as well as the near shore approach to the M-2 bridge. The hinge span was resting on the bottom of the stream. Two bulldozers were put to work to build up the causeway approach so that trestle spans of treadway could be installed and attached to the bridge. Almost immediately, floating ice carried away both their near and far shore end trestles, so the plan of installing trestle spans was abandoned. Work continued on the causeway . . . At 10:45 p.m. the near shore end of the bridge shifted downstream about 50 feet because of the ice jam pressure and the failure of the deadman on one of the two anchor cables. With this shift, extension of the causeway was abandoned and a Brockway bridge truck winch was used to help hold the bridge and keep it from further shifting. At 11 p.m. prepared float sections were assembled with the intention of connecting them to the existing bridge.

At 3 a.m. work was stopped on the bridge because of the excessive stream velocity. It was then decided to construct an entirely new bridge on a new center line.³¹ The new bridge was completed two days later.

The last bridge story is related to us by an engineer first Lieutenant, and it deals with the bridging of the Soyang River in North Korea. Only a few of the more interesting details are recounted below:

The Soyang River cuts a wide channel with steep banks across the X Corps main supply route in the vicinity north of the 38th parallel. The steep mountains on each side of the river made

this natural obstacle even more formidable because it was not possible to cut a new road to a narrower part of the river where bridging would have been relatively easy. During the season of low water, the river bottom could be used as a road with a floating bridge across the main channel. But to keep a floating bridge in place during the rainy season was out of the question.

The decision was made to put across a 660 foot (later increased to 770 feet) "triple-single" Bailey bridge on centers of 110 feet.

The approach roads to the bridge site had to be built across rice paddies on the south and a combination of paddies and river bottom on the north. The soil was an extremely fine and unstable sand-silt loam with numerous underground springs. Attempts at excavation produced a material that resembled chocolate pudding. However, by using a clam shell to remove the muck and hauling in river rock of from 6 to 12 inches in diameter for the subgrade, a reasonably stable road was constructed.

To stop the seepage of the underground springs which continued to dissolve the face of the south abutment, a drag line was used to cut a diversion ditch between the high ground south of the road and the road itself. This intercepted and channeled the ground water away from the road and into the river.

One day of hard continuous rain followed by a day of light rain raised the river 3 feet and, because of the flat land immediately adjacent to the main channel, increased its width about 45 feet at the floating bridge sites. (Authors' note: Two floating bridges had been constructed by engineers in the vicinity of the Bailey Bridge site a few weeks earlier.) In spite of the tension on the bridges and an abutment under 18 inches of water, the engineers managed to keep at least one of the treadway bridges open for traffic at all times. This was made possible by the judicious use of a bulldozer to change the channel of a tributary to the Soyang and by using large quantities of hemp and wire rope. The current at the bridge sites was running as high as 8.5 feet per second.

From earlier experience it was known that setting piling in the river was extremely difficult. The river bottom was composed of river rock that ran from 2 feet in diameter down to marble size and same with a high silt content . . . three methods of setting the piles were used. In the stretches of sand and silt, piles could be driven until they sank . . . A second method involved fabricating large shape charges of explosives packed around paper cones and set off to cut a vertical hole in the gravel to help the pile penetrate. Sometimes a small amount of excavating was done before the explosives were set to allow deeper penetration. The third method was jetting.³²

In his closing remarks, Colonel Itschner encourages us to conduct bridge training in such a way that it corresponds to combat firing and maneuvers. He states that, "Bridge construction training must include work under inclement weather conditions, at night, and in difficult types of terrain. The poor work sites and presence of many sand bars in the rivers of Korea during the dry season made the construction of float bridges and the operation of ferries difficult and time consuming."³³ And as we saw from the examples above, the rainy season and winter do not improve the situation much.

Writing about engineers, an Infantry Lieutenant Colonel had the following to say about accomplishments of engineers during the Korean War. He covered the gamut of engineer missions which were done well - some of which have already been covered above. We have extracted a few unique accomplishments which we found to be interesting:

Shackled to the highways! Too many tanks and trucks, too much artillery! You can not fight a war with heavy equipment in Korea. Such were the accusations of many critics during the grim days of last December (1950) when hordes of Chinese swarmed over the hills to hack at American motorized columns. Some even proposed that our Army revert to the standards of the enemy, and do away with their big guns and high powered equipment . . .

After all, mountainous Korea, with its primitive roadnet, was scarcely the ideal maneuvering ground for American armor . . .

However, those who would have revised tactics and organization so drastically to combat the methods of the enemy overlooked two very important factors: First, they had forgotten that the axiom of the American Army is firepower . . . Second, they had not taken into account the Army Engineers. If Korea did not have the roads needed for fighting our kind of war, then the engineers could build them, as they had done no more than eight years earlier in Burma, in Okinawa, and in the jungles of New Guinea . . .

First step in any combat engineering operation is an on-the-spot reconnaissance of the section of the road in question - often still in enemy hands. Employing jeeps, Army liaison type aircraft, and helicopters, engineer reconnaissance teams have gone out night and day, right along with, and sometimes in advance of, the attacking infantry, to locate damaged bridges, check road conditions, and spot critical highway locations in the zone of operations. Army aircraft, assigned to engineer units in combat for the first time during the Korean War, give the engineers a quicker, deeper and wider view of the battlefield roadnet . . .

Many outstanding engineer feats have been accomplished. The 185th Engineer Combat Battalion built the longest Bailey bridge in Korea (Sonyang Bridge), in fourteen days, just over half the estimated time; Company C of the 73rd Engineer Combat Battalion transformed a twisted mass of wreckage into a permanent concrete and steel bridge in thirty days. The 116th Engineers, a National Guard Battalion from Idaho, and the 1343rd Battalion, a National Guard unit from Alabama, have taken important parts in the construction program as has the 512th Engineer Dump Truck Company . . .

Major Vernon L. Watkins, Engineer Officer of the 8224th Engineer Group, (who served for six years with the Denver District of the United States Forestry Service) has met the threat (of dangerous landslides occurring when the roadbed itself gives way) by using a type of cribbing successfully employed on Colorado mountain roads. Whereas most retaining walls

are built of cribbing composed of vertical and horizontal log lacing the Forestry specification calls for additional lateral binders, which laterally anchor the retaining wall to the center of the roadway. In effect, the weight of passing vehicles serves to reinforce their own support . . .

Captain Robert Milosovic of the 630th Light Equipment company is credited with devising a unique form for the construction of concrete culvert sections, which are used in vast quantities here. The form, made of heavy rubber conveyor belting, is easily removed from the finished culvert section and its use speeds the production of concrete culverts immensely . . . and in the use of damaged oil drums the engineers have shown themselves master improvisers. Oil drums have been used for road culverts, for a novel type bridge, as scour protection for bridge piling and other purposes . . . 34

Landmine and Countermining Warfare

Landmine and countermining warfare played an increasingly important role in the Korean War as the conflict progressed. Mines, however, were not used as extensively as they had been during World War II, either in North Africa or Europe. The rugged terrain of Korea which channeled movement along roads and through passes tended to concentrate mine activities to relatively confined areas. This by no means decreased the effectiveness of mines but made their proper use more profitable. Combined with natural barriers, supplemental mine barriers assisted military operations. The following examples provide a sample of uses of mines by both sides:

Enemy road blocks and infiltrations compounded the problem of withdrawal. For example, a North Korean roadblock southeast of Taejon made effective use of mines to block the escape route of the town. Heavy casualties were inflicted on American forces attempting to pass through the area on 20-21 July 1950 and most of the troops who got through were successful only because they took to the hills. 35

As the withdrawals continued, mines were emplaced to slow the advance of the enemy. For instance, in the area to the southeast of Seoul, the Engineers in support of the 24th Division installed all the mines they had, and when no more were available, they improvised numerous substitutes - grenades for AP mines and spikes with taped blocks of TNT. One company laid 1,020 antipersonnel mines and 185 antitank mines. This job was more difficult than a normal fortification job because almost the entire regimental area was inaccessible by road and all supplies had to be carried over steep mountain trails.³⁶

The spring weather with its alternate freezing and thawing caused variations in mine sensitivity which were difficult to counter. In the morning a mined earth road might be frozen and tanks would pass over it unhindered. Later in the day during a warm period the road would thaw and a jeep might detonate the underlying mines.³⁷

The ever increasing profusion of mines required an immense amount of work in detection and removal. The box mines, especially, were hard to locate with detectors because they were made of wood, and since the ground was so littered with shrapnel, the detector buzzed constantly. Probing was almost impossible because the country was mostly rock. The way to find mines was to walk along the road and see where they had been put. The enemy was developing ingenuity in placing mines and also in burying them, so that sometimes they were practically impossible to detect. Quite often, the road bed itself - 12 to 16 feet wide - would be anywhere from 1 to 3 feet above the surrounding ground level. To avoid giving any evidence that a mine had been placed, the enemy would dig it in from the side of the road and then fill the hole back up. Anyone searching the top of the road would never find the mine and anyone walking along the side of the road would most likely not find it either because the site would be covered with vegetation. The enemy used another stratagem that was effective. He would bury a mine anywhere from 2 to 6 feet underground. Several mines would be buried and a long log placed upright on the mines with the top of the log just beneath the surface of the road. "If the mine wasn't found - and it couldn't

be with a detector - the whole works went up." According to Major Farley of the 2nd Engineers, by mid-1951 the mines were so thick that no matter how carefully the engineers went over an area, they couldn't find them all.³⁸

The rugged aspects of most of the terrain made mine laying both easy and difficult. Easy in that in concentrating on the roads (most of them of earth) mines could be laid with a minimum of difficulty both in transporting the mines to the site and emplacing them in the roads. On the other hand, emplacing them to develop barriers in the hills was frequently very difficult because of steep slopes, rocky ground, and logistical problems. The flat areas along the coast and the broad valleys in the vicinity of Seoul were distinctive in that they provided the most suitable sites for larger minefields. In placing mines on roads and trails both UN and Communist forces utilized local terrain features to advantage. A favorite Communist device was to surreptitiously mine fords or bypass routes around destroyed or light capacity bridges. Another was to place mines along trails opposite natural obstacles so that a driver, turning aside to pass a large tree³⁹ or rock, would drive his vehicle on to a mine.

The cold winter climate, particularly in the months of January and February with accompanying snow and ice, imposed special problems on the conduct of landmine and countermine warfare . . . special techniques must be employed if mines are to be laid in snow and the field carefully monitored for changes in snow depth from periods of thaw. Accompanying the operational difficulties of the mines themselves under cold conditions are the problems of physically handling them. The bulkiness of cold weather clothing and headgear makes for awkward movement. Handling of components with gloves and mittens is cumbersome . . .⁴⁰

Rain and fog are two other climate factors of significance to mine warfare in Korea. The heavy summer rains of July to early September turned earth roads into quagmires making both placement and removal of mines difficult and causing malfunctioning through displacement. Similar conditions occurred to a lesser extent off road although vegetation and the undisturbed nature of the soil were stabilizing factors. Fog,

which limits visibility, was an additional element, particularly in summer along the coast. This made mines difficult to detect when clearing or breaching and also made orientation difficult when mine laying.

To complete our panoply of events from the Korean War, a short example of how the enemy was able to operate his resupply lines and reinforcements is offered.

Our enemy has made little use of camouflage in attempts to hide rail or highway bridges. At times foliage has been placed on the outer edge of deckgirder rail bridges to disrupt shadow lines. Some highway crossings, of a type erroneously referred to as "underwater bridges," have been used, and are generally difficult to discover. These are usually nothing more than fords, built up with sandbags, timber, or crushed rock to within a foot or two of the water level. The best examples of deceptive techniques have appeared at rail crossings. In some instances, after repairing a damaged bridge, the enemy leaves one or two spans out of the bridge during the day, but puts them in place during the hours of darkness, when 95 percent of all traffic movement takes place. This ruse was first uncovered in November 1951, when for an unusually long period an important rail crossing remained apparently unserviceable because two spans were missing. Then a night reconnaissance photo revealed the spans in place with a train crossing the bridge. The next day two spans were again missing from the center section of the bridge. This technique was employed at as many as three bridges simultaneously. Another example of attempts at deception was revealed at the pontoon crossing of the Yalu River at Chongsongjin, near the Suiho Dam. After a successful strike against a pontoon bridge, the enemy reconstructed the bridge, but kept it dismantled in sections during daylight hours, only to swing the missing center sections out into place at night to allow vehicle traffic to cross the river. This ruse was also discovered by a night photo aircraft . . . Against an enemy repair organization with this caliber of planning, organization, and high capability, an interdiction

campaign conducted under present restrictions
can never achieve its goal⁴² of complete denial
of resupply to the enemy.

Well, we have dwelled too long and our examples could become endless. It suffices to say that the many lessons discussed above provide us with a starting point in understanding the environment and what happened there during the last war. They are simply footprints for us to follow. And for us engineers, following footprints through a minefield is very important - it could be deadly if we don't pay attention. So ends our revisit to the land of the "Morning Calm."

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CHAPTER IV

TACTICAL SCENARIOS

War plans cover every aspect of a war, and weave them all into a single operation that must have a single, ultimate objective in which all particular aims are reconciled. No one starts a war - or rather, no one in his sense ought to do so - without first being clear in his mind what he intends to achieve by that war and how he intends to conduct it. The former is its political purpose; the latter its operational objective. This is the governing principle which will set its course, prescribe the scale of means and effort which is required, and make its influence felt throughout down to the smallest operational detail.

Clausewitz, On War¹

INTRODUCTION

Since the War for Independence, we as a nation have started very few wars. We have, however, been drawn into many wars, including two World Wars, by nations that did not heed Clausewitz's wise counsel. Our involvement in any potential future conflict would most likely occur in the same manner. Therefore, for us, Clausewitz's advise is to have clear in our minds that which we intend to do when we enter the conflict. To assist us in that endeavor, the authors have selected three specific tactical scenarios for possible Light Contingency Corps deployment. The purpose of this chapter is to discuss the employment of the Engineer System within each of the three contingency missions, and to evaluate its capability to provide MOBILITY, COUNTERMOBILITY, SURVIVABILITY, and GENERAL ENGINEERING support to the Contingency

Corps. It is intended that the information presented in the preceding chapter serve as the basis for further discussion and analysis here. Our attempts to fully eliminate duplication have not been successful, and for that, we ask your patience.

The strategy of activating a Light Contingency Corps is to make full use of the principle of economy of force. As Clausewitz said some 150 years ago, our objective " . . . is always to make sure that all forces are involved - always to ensure that no part of the whole force is idle. If a segment of one's force is located where it is not sufficiently busy with the enemy, or if troops are on the march - that is, idle - while the enemy is fighting, then these forces are being managed uneconomically. In this sense they are being wasted, which is even worse than using them inappropriately. When the time for action comes, the first requirement should be that all parts must act . . ."² What he is saying is that all elements of a military force must contribute towards the accomplishment of its objective. In war, there is no place for excess baggage.

In today's resource constrained environment and the scarcity and criticality of strategic lift, this principle is applicable to the employment of the Engineer System as an economy of force. Because of the investment represented in technically trained personnel and in mechanical equipment with its specialized maintenance support, it is essential that the number of engineer units deployed in Light Contingency Corps operations be no greater than required, and that they be employed where the need for their capability is greatest. This requires flexibility in organizational structure and command to respond to the

needs of the tactical commanders in today's fluid battlefield.

Based on our current force structure, the Light Contingency Corps, by necessity, is heavily dependent on the Reserve Components (RC) for its combat support and combat service support elements. Its capability depends on the "Total Force Concept." Being in its formative stages, the Light Contingency Corps has a unique opportunity to develop effective, efficient and cohesive relationships between the Active Force (AF) and RC components. It is imperative and crucial for the maturing of the Corps to improve and solidify understanding, communications, and training within the interdependence of the total force. Without it, the Corps cannot hope to achieve the combat readiness required to accomplish its assigned contingency missions.

The integration of the Engineer System to enhance the combat capability of tactical forces has been, and will continue to be, a tremendous challenge. The improved capability and mobility of the Abrams (M-1) tank and the Bradley Infantry Fighting Vehicle (M-2/M-3) weapon systems will exacerbate that challenge in the future. These weapon systems have the capability and flexibility to move quickly (upwards to 45 miles per hour) around the battlefield. Their full capabilities, however, may be severely limited by the less mobile, less serviceable combat support and combat service support systems. "Much of the Army's land-combat support materiel - indispensable to operations anywhere - is old and not suited to current tactical doctrine . . . The Army's combat engineer and field logistics service units are, with only a few exceptions, inadequately equipped to discharge their missions under current doctrine . . ."³

The limiting capability inherent in our outmoded engineer equipment, as well as other support equipment,

may not only reduce the flexibility and mobility of the new weapon systems, but it may also increase their vulnerability to wise enemy tacticians who can exploit this obvious mobility mismatch.

The Light Contingency Corps structure is being formulated to incorporate high technology capabilities forthcoming from current 9th Infantry Division "High Technology Test Bed." This effort should develop a force capable of defeating a sophisticated enemy of the future. For this capability to become reality, however, the mobility mismatch, mentioned above, must be seriously addressed. Otherwise, the effectiveness and capability of our highly improved combat weapon systems will be severely degraded. The price we may have to pay for this degradation will not be that which is argued in the "Budget," but the ultimate price of failure in the battlefield. Simply, we must do better in this area.

Looking downstream, as the Light Contingency Corps matures and grows, its deployment should be as a Corps, rather than as separate brigades or divisions. Engineer units must be organized, equipped, and trained to offer the most responsive support possible throughout the Corps area of operations. The development of engineer units with capabilities that cover the whole spectrum of combat engineer tasks, performed well forward in the Corps area, or in support of deep attack on the enemy's second echelon, indicates a need to identify all the possible requirements for engineers, and a careful assessment of current engineer capabilities.

Although the creation of an ideal engineer force, one that can do anything, anytime, anywhere with equal facility, may be a "pie in the sky," it is possible to relate the current engineer force to specific areas around the globe with national interest implications. The result should be engineers who can accomplish high priority combat support missions required for tactical success. Additionally, the definition of contingency missions weighed against current engineer capabilities will give commanders specific direction for their training programs, and reduce the uncertainties that bother some engineer commanders today.⁴

The Army's new Doctrine Manual, FM 100-5, summarizes this issue as follows:

The engineer system is employed to preserve the freedom of maneuver of friendly forces, to obstruct the maneuver of the enemy in areas where fire and maneuver can be used to destroy him, and to enhance the survivability of friendly forces with protective construction. Engineer plans must be fully coordinated with the scheme of maneuver and fire support plans. They must allocate units and furnish a clear list of mission priorities.

Time, equipment, and materials may restrict the amount of engineer work that is accomplished before and during battle. Engineer plans must reflect these limitations realistically. Priorities must assess the necessary trade-off between survivability, mobility, and counter mobility tasks. Normally, priorities must also assess the concentration of effort in vital areas at the expense of general distribution of engineer assets throughout the force.⁵

This prioritization concept⁶ is graphically displayed on Figure 4. All the engineer tasks, to be performed by the Engineer System, are grouped by engineer function (mobility, countermobility, survivability, and general engineering). Each of the tasks is then assigned a priority

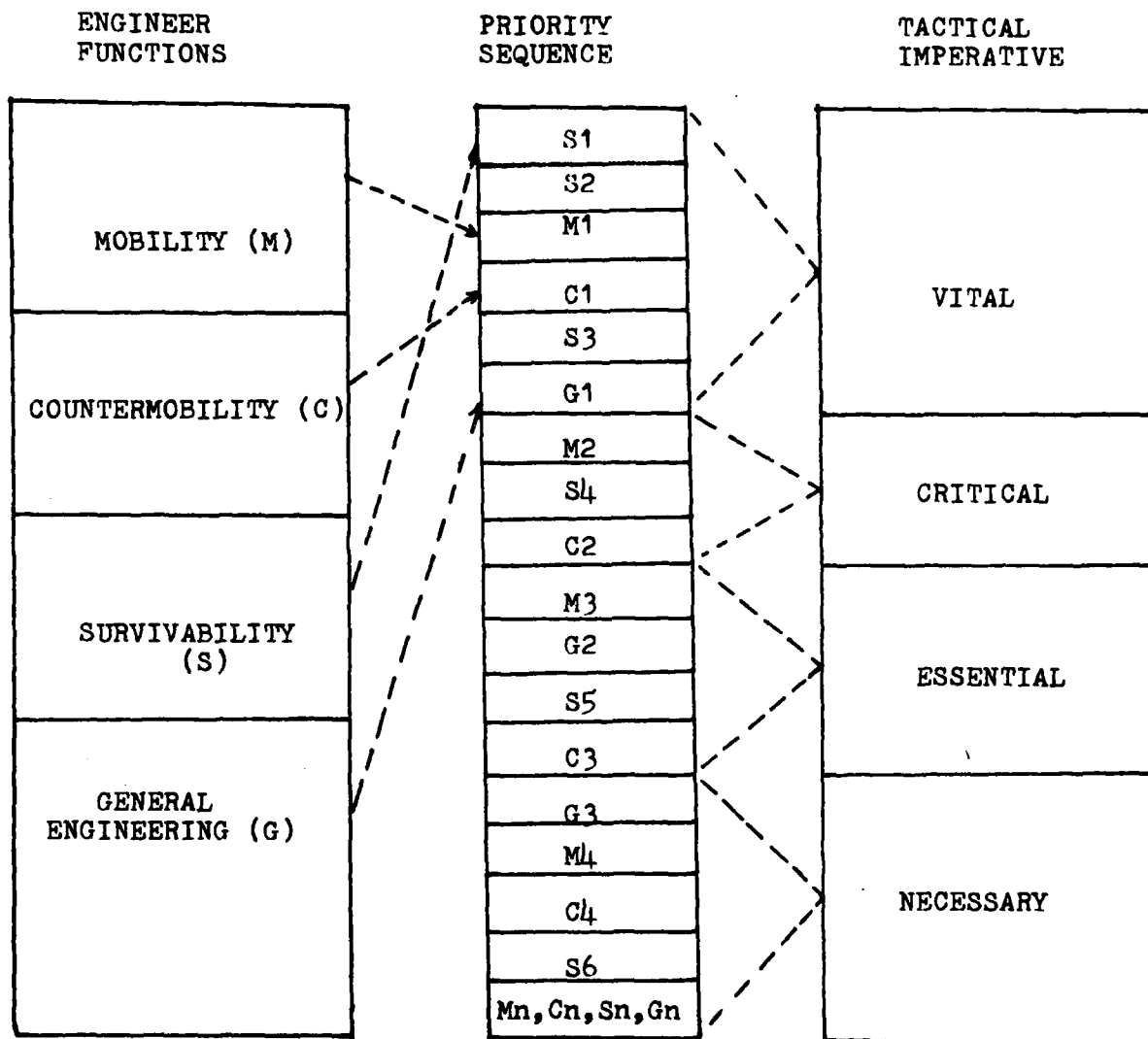


FIGURE 4
PRIORITIZATION MODEL

tactical situation. The commander based on its value or contribution to the particular^{at} the appropriate level must set priorities. The Engineer System must then apply its limited resources to those missions in order of priority established by the commander (vital, critical, essential, or necessary).

This priority scheme does not imply that the commander assigns priorities in a vacuum - he must make full use of input from his subordinate commanders, staff, and other combat systems operative in the battlefield. Nor does it mean that the model becomes inflexible once the priorities are established. To accommodate the fluid nature of the modern battlefield, the model must remain dynamic and flexible. The fact that insufficient engineer assets exist in the force structure today dictates maximum utilization of the Engineer System under the "economy of force" principle. Priority of engineer effort is considered an imperative in any future battlefield.

Engineer Mobility Enhancement - Aviation Variable

Engineer mobility will be discussed in more detail later in this report. To provide some basis for that discussion, however,^(it is necessary to provide some) background information on the tactical (Army) aviation system, its impact, capability, and potential on influencing other combat systems.

In August 1945, the War Department reorganized the importance of ^{and} Army Aviation⁴ expanded its use beyond the Artillery. Organic aviation was allowed and provided to the Cavalry, Infantry, Engineers, Armor and Tank Destroyer organizations. Since that time, aviation has had a significant impact on the ability of the engineers to provide effective and responsive support to the tactical units. As our forces moved quickly across Europe, engineer reconnaissance became critical in

discovering obstacles and bypasses. The use of observation aircraft facilitated this mission, which would have been very slow and difficult by ground reconnaissance.

During the Korean War, the value of aviation was rediscovered and lessons from World War II were relearned. New capability (the helicopter) was now available that had not been available to us during the close of the war in Europe. The introduction of the helicopter provided the engineer with a capability that had not been available with fixed wing aircraft. The H-19, H-21, H-13, and H-23 were used to accomplish missions that would have been impossible or infeasible by other means. The introduction of new fixed wing aircraft, such as the L-19 and L-20, continued to enhance engineer capabilities. As the availability of aviation increased, however, so did the demand on its capability. Prioritization for aviation support was found to be absolutely necessary.

Support requirements identified in the past as critical engineer missions are equally important today. A 1957 study⁷ lists the following priority missions for engineer support by aviation assets:

- a. Direct combat support of tactical units.
- b. General support of divisions and corps.
- c. Topographic support to artillery and missile units.
- d. Spare parts supply.
- e. Engineer Class IV Supply and map distribution.

The report specifically identified the following eight operations that depend most upon rapid and flexible engineer support, and could most benefit by the use of Army Aviation:

- a. River crossing operations.
- b. Passage or construction of barriers and obstacles.
- c. Armored-type offensive operations.
- d. Helicopter-borne offensive operations.
- e. Airborne operations.
- f. Retrograde operations.
- g. Denial operations.
- h. Amphibious operations.

Some airmobility concepts employed in Vietnam required engineer support to achieve the responsiveness needed by the fluid tactical operations employed there. To support combat assault missions into the heart of enemy sanctuaries, engineers flew in with the lead assault elements to clear and prepare adequate landing sites for the follow-on combat assault elements. Techniques were developed to insert engineer troops into the respective landing sites (dictated by tactical imperatives), i.e., "low hover" extraction, use of "troop ladder" or rappel from helicopters. Clearing operations with demolitions and chain saws usually could clear initial landing areas in a matter of minutes. Once an area was cleared and secured, larger equipment could be airlifted to the site to expand the landing areas.

Bridging operations in Vietnam also took on a different complexion. The capability of helicopters provided engineer units with the ability to bridge obstacles almost instantaneously. Bridge components could be prepackaged in a variety of configurations in the rear, airlifted to the desired location, assembly of packages completed at the site, and traffic could cross within a short time. The 65th Engineer Battalion (Combat), 25th Infantry Division, employed this capability and fully

explored its potential during the Vietnam War.⁸ For additional details, see Appendix 4.

Today, the capability of Army Aviation has increased dramatically in the light and medium lift capacity. Heavy lift capability continues to be a major deficiency. The load capacity of the various helicopters currently in the inventory are listed in Figure 5. Within these

<u>AIRCRAFT</u>	<u>CAPACITY IN POUNDS</u>
UH 60A Blackhawk	8,000
CH-47D Chinook	25,000
CH-47C Chinook	17,100
CH-54B Tarhe	25,000
UN-1H Huey	4,000

Figure 5. HELICOPTER LOAD CAPACITY

capabilities, the potential for engineer support enhancement by the use of aviation is limited only by one's imagination.

Although modern weapon systems have become more sophisticated and the lethality of the modern battlefields has increased considerably, the basic combat engineer missions have not changed all that much. Engineer capability, however, has lagged behind that of combat systems, and that is the focus for the remainder of this chapter.

A. FORWARD DEFENSE REINFORCEMENT

The forward defense concept invisions the employment of friendly forces well forward within the theater of operations. Both NATO and

Korea contingency areas require that the forward defense lines be at the respective contiguous borders. For the benefit of our discussion, it is assumed that strategic warning was adequate and the Light Contingency Corps was deployed as a reinforcing force. One possible scenario could follow along these lines:

It is envisaged that twelve or more North Korean divisions would attack down one of the major invasion corridors leading to Seoul (Ch'orwon or Kaesong) in the first phase of such an offensive. Each of the corridors is now defended by a single Corps of three or four divisions. North Korean regular infantry formations supported by armor and heavy artillery fire would seek to overwhelm the Corps in their path to open the way for a follow-up armored breakthrough to Seoul.

In such a scenario, the Light Contingency Corps could be deployed to reinforce the threatened corridor. For this particular contingency, the employment of the Engineer System can be considered to be in a mature theater, and thus allocation of engineer effort should be apportioned accordingly.

Mobility. Mobility is the reduction or elimination of obstacles, natural or manmade, to improve movement of maneuver units and critical supplies. The main engineer tasks are listed below:¹⁰

Fill craters and ditches by dozing or hauling fill material.	Span gaps with assault bridging.
Demolish and remove road blocks, trees, or rubble.	Make combat trails through wooded and heavily vegetated areas.
Make quick bypasses around obstacles.	
Clear paths through minefields with mechanical equipment or rocket-propelled line charges.	

The engineer effort must be responsive to the maneuver commander's tactical strategy to provide the flexibility to develop the battle in a manner most favorable to the friendly forces. The traditional mobility tasks for engineers have not changed. However, the time available to accomplish them has been reduced considerably. Modern military forces are more mobile and possess substantially more lethal weapons. Therefore, reaction time for engineers must be quicker and more timely or the tactical opportunity presented to the maneuver elements may vanish. The fast moving battle will produce more urgent engineer requirements on a shorter notice, and at greater distances and dispersed locations than in the past. Currently, the Engineer System does not possess adequate integral mobility, nor sufficient capability to satisfy the demands of the highly mobile battlefield we are currently projecting.¹¹ The Army needs to come to grips with this nagging challenge of mobility mismatch.

A partial solution may be the wider use of Army Aviation to assist in accomplishing engineer tasks, especially those that are difficult or impossible to accomplish on a timely basis by ground mobility. Realizing the constraints and increased demands placed on the aviation system, the engineer must articulate his requirements to the commander rather convincingly to receive the necessary priority.

Although our scenario is generally defensive in nature, Corps units will probably be configured in offensive formations. Division engineers will already be employed on engineer tasks in support of brigade operations. They will probably have more tasks assigned, especially survivability enhancement, than they can effectively handle. As they press closer to the front lines of own troops (FLOT), Corps

engineer units in the area will have to assume tasks within the Division area. As Corps engineer units attempt to move forward and laterally, their lack of vehicular mobility, especially when supporting armored or mechanized infantry units, will diminish their responsiveness and degrade their ability to assist the maneuver elements.

Restrictions of the terrain, ruggedness and lack of cross compartment roads, coupled with generally poor trafficability of the off-road areas, will require an enormous amount of engineer support to the combat mission. In the forward area precious response will be lost as convoys of engineer equipment are forced to detour around the more precipitous terrain as they move from one sector to another.

Additionally, Corps engineer units may be stretched very thin by ongoing combat missions and route maintenance missions in the Corps rear area. The push-pull for engineer assets between commanders at the FLOT and in the Corps logistics area could result in the underutilization and misutilization of engineer assets. The length of the lines of communication (LOC's) between the southern parts and the forward battle area, as well as the choke points along the route, will dictate a great amount of maintenance effort. As the defensive battle heats up in the forward area and Division engineers become fully engaged, Corps engineer battalions will, by necessity, be working well forward, leaving LOC maintenance responsibility to echelons above Corps or, more likely, to host nation support.

Lacking adequate mobility and capability, Corps engineers must maximize their use of other system capabilities. They must understand and make extensive use of the all source intelligence system, terrain analysis, weather, and sensor systems now proliferating the battlefield.

This is to complement and not replace the current unit capabilities (limited as they are). Where certain information is not available, they must place additional demands on these systems to provide the critical information required by the Engineer System to perform its missions. Increased use of aviation capabilities for supplementary reconnaissance, classification of routes and identification/selection of bypasses will also enhance the capability of the Engineer System. The added capability of airlifting engineer troops, materials, and engineer equipment (though limited) further enhances that capability. The engineers currently lack doctrine for the employment of the aviation system to support the engineer effort.

The following quotation by a distinguished lecturer, Dr. Douglas S. Freeman, exemplifies the need for innovation:

How strange it is that we rely altogether on the maps, when after all, we ought to know the ground. How strange it is that we always photograph the position ahead, so seldom photograph the position in reverse. If ever you were an engineer officer, or in charge of a position that seems in any way precarious, I tell you what you do. You get yourself a motion picture camera and you go back down the road that you've come up - and you will find yourself possessed of information that may be invaluable to you.¹²

Counter mobility. Counter mobility is the impeding of the enemy, providing time, space and protection to friendly forces, through the employment of obstacles. Counter mobility operations incorporate the employment of the following:¹³

Reinforcing obstacles.	Ability to effectively emplace obstacles in enemy held territory.
Existing obstacles.	Impact obstacles will have on the movement of friendly forces.
Atomic demolition munitions (ADM).	

In our scenario, most of the major obstacles and barriers should have already been employed. However, with the vicinity of the FL0T, the Corps engineers will be confronted with more than ample opportunities to participate in countermobility operations, such as, emplacing hasty road craters, minefields, placing mines behind enemy lines, and other hasty obstacles.

The advent of the Family of Scatterable Mines (FASCAM) has significantly altered our capability of achieving expedient, yet effective, countermobility missions by reinforcing terrain with the use of these mines. FASCAM provides a "dynamic" obstacle capability and can be quickly delivered in front of an advancing enemy by helicopter, ground dispensers, artillery, rockets, or by hand.

As the forward defense area builds up, the breaching operations necessary to support friendly counterattacks will take precedence over other engineer tasks. The breaching of enemy obstacles and minefields will be only part of the problem. Friendly forces will, due to FASCAM and other modern capabilities, be confronted with breaching their own minefields and obstacles. Breaching operations, already difficult, and the lack of adequate equipment, could be further slowed down if mines and obstacles are carelessly emplaced, with little thought given to future offensive operations as part of the overall defensive scenario.

The overall limiting factor for engineers in countermobility operations is their mobility capability to move freely about the battlefield and provide timely response to maneuver unit requirements. This we consider to be a critical factor, and its full impact must be taken into account by the tactical commander at the beginning of any operation. The problem with the mobility mismatch currently in existence has already been addressed above.

Survivability. Survivability is development of protective positions, and employment of countersurveillance measures of camouflage, deception and smoke.¹⁴

Survivability tasks will initially be at the top of the priority list for this particular scenario. Survivability will be a primary concern of units deployed in the Division areas. The proliferation of armored vehicles and increased lethality of anti-armor weapons dictate rapid digging-in capability. The M-9 armored combat earthmover (ACE) has the capability of providing engineers with a much more responsive and less vulnerable earthmoving capability for digging-in units. As recently reported, however, its future remains uncertain.¹⁵

Ammunition, supplies, and tactical command and control facilities must also be protected. As friendly forces develop stronger forward defenses, the requirements to dig in, build bunkers, and harden emplacements will increase concurrently. Survivability tasks are within the capabilities of combat engineer units, but the urgency of the situation may require augmentation of heavy engineer equipment. Moving engineer combat heavy battalions into forward areas, or attaching Combat Support Equipment Companies to combat engineer battalions would enhance survivability. This would be at the expense of other missions in the Corps area.

As mentioned earlier, the bulk of the engineer units for the Light Contingency Corps will come from the RC. Many of the subordinate engineer commanders interviewed¹⁶ have expressed concern that, by the time their units arrive in country, the conflict will be many days old and engineer requirements will have surpassed the capabilities of Division engineers, already fully committed in survivability tasks.

By the time the full TPFDL is deployed, the engineers will be behind the power curve and maneuver commanders forced to trim their priorities down to the bare minimum - only those engineer tasks needed to guarantee the survival of the Corps. This necessity is not to be taken so much as a deficiency but as a factor attendant to all the machinations involved in deployment of the current engineer force - largely Reserve Component. The time-phased deployment and build-up of Corps engineer units will require combat commanders already engaged to make hard "either-or" decisions concerning the use of engineers. Effort priorities must be established early.

General Engineering. General engineering missions provide engineer support to units and activities in the brigade and division rear areas. Corps engineers supporting divisions provide the primary capability to accomplish the following general engineering tasks:¹⁷

Improving and maintaining essential combat and main supply routes.
Replacing assault or blown bridges with tactical bridging.
Clearing minefields.
Developing forward support areas for rearming and refueling.
Providing potable water.
Providing terrain studies.

Combat commanders are naturally most concerned with shooting, maneuvering and defeating the enemy. Years of developing plans in Europe and Korea that will make it possible to win the first battle, with the forces and materiel available, have made general engineering the stepchild of the Engineer System. If we stack all our engineer capabilities in the forward areas, what becomes of the construction needed to enhance the operation of combat service support units in the logistics area (COMMZ)? If the press of the battle is forward in direct support of combat units, who accomplishes the vast amount of general engineering needed to house troops, harden depots, repair and expand ports and airfields, protect command, communication, and automated data processing facilities, ammo storage, maintenance facilities, bridges, hospitals, area supply and distribution facilities, and all the other engineer missions - too numerous to list here?

The combat heavy battalions and combat support equipment companies will most likely be well forward engaged in combat engineering tasks. And if host nation support is an enigma and provides no assurance that it can cope with general engineering requirements, we are then faced with the dilemma of having the capability to conduct effective combat operations only as long as pre-positioned stockages and initially deployed forces last.

Also, if the conflict shifts into a sustained war, or the scenario of forward defense along the boundaries changes to an offensive scenario, activities in the Corps area between Division near boundaries to the COMMZ area will take precedence over everything else. Rethinking the employment of engineer assets in the middle of a war conjures all sorts of problems that could be addressed right now, if we were only willing

to plan beyond the initial phases of the war. Our research revealed that we are grossly deficient in our planning to identify, prioritize and resource general engineering requirements for any contingency area. There are some bright spots, however, as some units are starting to incorporate these requirements in their plans. Much more work remains to be done in the areas of doctrine, equipment, training and mobility.

B. Reinforcement to Restore Original Boundaries

This scenario assumes that no, or inadequate, strategic warning was available and the enemy has effected some penetration or breakthrough. The Light Contingency Corps may then be employed as a reinforcing force to assist in restoring the original boundaries.

A possible scenario could be as follows:

In the absence of adequate warning, the assigned Republic of Korea (ROK) regular forces could not fully man the barrier defenses in the Seoul corridors, and the militia could not carry out its planned task of laying minefields. Accordingly, given surprise successfully achieved, it is envisaged that the North Koreans would attempt a classic, high-speed, deep-penetration offensive by massed formations of battle tanks, to break through the anti-tank barriers before they could be closed and adequately defended. Since the North Koreans could deploy their forces in jump-off positions without being detected, and since front-line ROK forces are now concentrated in a forward perimeter defense, this threat is particularly salient. To be sure, the barrier systems on the Seoul corridors are laid out in depth from the DMZ to the city outskirts. But the defense of these barriers depends in part on troops that must withdraw to hold them in sequence. It is feared that the high-speed elements of the armor "Blitzkrieg" (and/or airborne assault troops) could seize the barriers before they can be fully manned by either withdrawn troops, or by allocated reinforcements.

In addition to these regular-force threats, it is believed that the North Koreans might also launch a campaign of sabotage and guerilla-type raids against both military and civilian targets in the deep interior of the ROK. In a variant perception, this threat is thought to be directed against Corps rear areas. Such raids and sabotage missions would be carried out by activated in-country sympathizers (rural guerillas and urban terrorists) and also by troops of the North Korean 8th Special Corps, infiltrated by air or sea. The 8th Special Corps controls commando-style reconnaissance units and infiltration-oriented light infantry.

In such a scenario, the Light Contingency Corps would be employed as either a replacement Corps or a reinforcing Corps, similar to those employed during the early stages of the Korean War in 1950. The employment of the Engineer System in such a scenario can be considered to be in a partially mature and partially destroyed theater of operations. The amount destroyed would be dependent on the enemy's surprise and penetration. The amount of engineer effort would be much greater and the prioritization of effort more critical than that of the preceding scenario.

Mobility

The battlefield in the scenario presented above will be a complicated and confusing place, and will present much friction to reinforcing units being inserted into that battlefield. Clausewitz captured the essence of friction in war perfectly in his concept of "Friction."

Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war . . . Countless minor incidents - the kind you can never really foresee - combine to lower the general level of performance, so that one always falls far short of the intended goal . . . Friction is the only concept that more or less corresponds to the factors

that distinguish real war from war on paper . . .
Friction, as we choose to call it, is the forge
that makes the apparently easy so difficult.

Those that do not take "friction of war" into account in their plans and execution will become frustrated and are doomed to failure. This is particularly important for the engineers because of the many demands that will be placed upon them, the conflicting priorities that will abound with the fluid battlefield and the scarcity of resources available.

In this scenario, mobility continues to be a major concern as it was in the preceding scenario. The overall offensive and the dynamic characteristics of defeating deep enemy penetrations and restoring original friendly lines add another dimension to mobility operations. The build-up of materials, the movement of troops, and the relocation of combat support and combat service support units will affect trafficability of main and secondary routes. Route and bridge maintenance will have to employ enough of the engineer assets to assure the success of a counterattack of major proportions over many kilometers of terrain.

Once again, the mobility capability of Corps engineer units as compared with organic division engineers affects the planning of the battle. As brigades press forward in the attack, Divisional engineer units will be passing tasks off to Corps engineer units following close behind. The mismatch in mobility would, in the worst case, impede close and effective coordination between Divisional and Corps engineer commanders. As the Divisional engineers drive on with their combat elements the gap between them and the slower Corps engineer units would widen to the point that the Direct Support (DS) Corps units

could not respond to their needs in a timely manner. This obvious mobility mismatch must be seriously addressed because it could ultimately become a "war stopper."

In the absence of additional ground mobility, the use of Army aviation for airlifting of supplies, equipment and personnel may assist in the conservation of critical assets. Airlift can provide the critical supplies, equipment and personnel needed to accomplish a difficult mission precipitated by the tactical situation or enemy destruction. The helicopter can be used in the emplacement of a variety (FASCAM) of minefields quickly and effectively. It also provides the capability for expedient reconnaissance of minefields, and it can assist in the breaching of obstacles and minefields. The engineer community needs to develop some innovative applications for the modern Army Aviation System. The use of the helicopter for expedient bridging operations has already been discussed earlier in this report. A variety of bridge loads, for each type of bridge and helicopter in the inventory, must be developed and incorporated in the appropriate manuals. There is no need for each unit in the force to continuously experiment for the first time. Our research revealed that "lessons learned" in this area are rarely transmitted to other units. No effective mechanism now exists, and must be corrected.

Countermobility. Breaching of obstacles and minefields remains a major task in this scenario (initially defensive, but primarily offensive in nature). Operations conducted by friendly forces to retake lost territory will mean that the Light Corps units will be breaching obstacles and minefields along the various phase lines initially

abandoned by friendly units or installed by the retreating enemy. As the counterattack offensive moves closer to the original line, the obstacles impeding friendly maneuver elements will be closer together, denser, and will require the use of more engineer equipment and troops. Timely response to the needs of combat commanders as they encounter obstacles, mines, and rivers demands close coordination between Divisional and Corps engineers, and enhanced mobility for the Corps engineer units.

Counterattack lanes must be selected and cleared. The supporting engineers must assist the tactical commanders by articulating the engineer requirements for the various options and the advantages offered by a particular terrain. Then, once the tactical decision is made, the engineer commander must apply all the engineer effort available to expeditiously modify the terrain so that tactical maneuvers are maximized. The use of helicopters can assist the engineer commander in accomplishing his coordination and assistance to the maneuver commanders very quickly. The engineer must strive to maintain a high priority on the demand for Army aviation during this phase of the operation. For tactical success, countermobility is absolutely vital. If not available or timely, tactical operations will get bogged-down and lose momentum. Neither of which is desirable.

Survivability. Survivability missions are also a vital concern in this scenario. Rapid tactical movement of combat units, however, allows engineers to shift some of their priority from hole digging to protection of command posts, logistical materiel, and other support functions in Division rear areas, including rear area security and protection missions. The initial phases of this scenario will require

similar survivability missions as discussed in the first scenario.

General Engineering. Construction requirements will continue to vie for engineer assets in this scenario. Once friendly forces slow the enemy enough to assume the offensive, general engineering tasks will move up on the priority list in order to develop the required logistical and service base to support large scale offensive operations.

Once the offensive is in full gear, however, Corps engineers will be moving quickly forward with the tactical units, performing primarily combat engineer mobility/countermobility missions. General engineering missions will have to be done by either Echelons Above Corps (EAC) or by host nation support organizations. As stated earlier, this must be planned early. The "friction of war" does not allow this function to occur easily during the heat of battle. Combat commanders and support unit commanders will be placing competing requests and priorities for the scarce engineer resources.

C. Air Land Battle-Offensive Maneuver Operations

FM 100-5 states that "Air Land Battle doctrine is based on securing or retaining the initiative and exercising it aggressively to defeat enemy forces. The object of all operations is to throw the enemy off balance with a powerful initial blow from an unexpected direction and then to follow up rapidly to prevent his recovery. Destruction of the opposing force is accomplished by attacks on critical units or areas whose loss will degrade the coherence of enemy operations."

"Army units will fight in all types of operations to preserve and exploit the initiative, to attack the enemy in depth with fire and maneuver, to synchronize all efforts to attain the commander's goal,

and to maintain the agility that is necessary to shift forces and fires to the point of enemy weakness."²⁰

This is not to be construed as a unique scenario. It can evolve from either of the previous scenarios. The main element of this scenario that has not been discussed above is that revised doctrine of Air Land Battle does not exclude offensive operations deep into the enemy's rear. And as such, the employment of the Engineer System, in the full gamut of offensive operations, may go from a mature theater, to a partially destroyed theater, to an immature theater (comparatively speaking). In the NATO scenario, offensive operations may range from the Federal Republic of Germany (FRG) to deep inside the Warsaw Pact countries. In the northeast contingency, offensive operations may range from well inside the ROK to deep penetrations into North Korea. Of course, this scenario presupposes that the political imperatives have been satisfied prior to commencing offensive operations as discussed here. The Light Contingency Corps could be employed as the counter-attacking force or as reinforcing the main attack.

Mobility. Some of the fine points of conducting an attack deep into the enemy's second echelon are still being debated by the various branches. Although many ramifications of such operations are still vague, implications about the role and importance of engineers are obvious. Any assumptions about the speed of a deep attack or counter-attack are liable to fall short of actuality. A task force penetrating deep into the enemy's rear will protect itself by its mobility and capability to apply firepower in a critically decisive time and place. Our research revealed that Corps engineer (non-Divisional) units

currently lack the mobility to support such an operation - even if it left an excessive amount of its equipment, and thus capability, behind!

As it stands now, the assignment of Corps engineer assets to a deep counterattack is probably less desirable than replacing Divisional engineers in their most forward deployment while they go as part of the task force. If such were the case, mobility, while still a problem as they operate in Divisional forward areas, would be less detrimental. Using Corps engineers in a Divisional engineer role would give away some of the responsiveness division commanders enjoy, and could have a limiting affect on those Divisions should the situation suddenly change.

Mobility missions and priorities will change as tactical operations transit from the mature to somewhat immature theater of operations. The Engineer System must remain flexible throughout to accommodate these shifts - as the "point man," the engineer must be out in front anticipating the needs of the tactical commanders. The engineer support plan must remain current reflecting the dynamics of the battlefield and the resources available.

Counter mobility. Task force commanders conducting attacks deep into the enemy's rear must have obstacles and mines cleared in the most rapid and expedient way. Attacking units will rely on maneuver and mobility to afford them some measure of protection as they operate in an exposed mode among deployed enemy units. Gap crossing can be accomplished by the units themselves up to a point, however, deliberate river crossing operations and breaching of major enemy barriers will require the employment of highly efficient and equally mobile engineer units. This scenario again highlights the close reliance upon mobility

in order to accomplish countermobility tasks in an effective and timely manner.

Engineer units especially configured to support a deep strike mission will enhance their mobility and gap crossing capability through the use of Army aviation to move troops and equipment, lift prepared rafts and bridge components (as discussed earlier in this report). Otherwise, the procurement of highly mobile engineer equipment, such as the ACE (M-9) or other equipment having similar capabilities, becomes imperative and critical.

Survivability. The importance of survivability tasks on today's lethal battlefield have been mentioned above, and are well known to all commanders. Forces conducting Air Land Battle operations must possess the capability to hastily accomplish expedient survivability tasks as they maneuver in the attack. Flank protection will require the use of scatterable mines as well as mines laid conventionally. The expeditious use of natural obstacles in concert with demolitions and firepower will also be required.

The development of battalion size battle positions and strong points will employ combat engineers well forward of friendly lines. The engineers must plan and train for these types of missions well in advance. Our research reveals that we are not doing very much of either at the present time. Most of our planning and training is geared towards meeting the requirements of the first two scenarios. If the Air Land Battle concept is to become reality, everyone must get on board and start incorporating the concept into their plans and training.

General Engineering. The sustained offensive operations scenario implies overall sustained operations. Therefore, the more protracted

the war becomes the more urgent is the requirement for troop housing, hospital facilities, and all types of improved sites for ammo storage, materiel build-up facilities, and other logistic facilities required for a long war. For long war sustainment, this scenario is not likely to occur until all deploying forces arrive in country and the Corps rear area is developed to capably sustain it. Host nation construction support requirements will be sizable during the initial phases of the war, and remain rather constant in the logistics area thereafter.

The engineering effort needed to support Air Force and Army Aviation operations will magnify as the conflict becomes more protracted. The operation of quarries, pipelines, ammunition handling facilities, refueling points, etc., will take on more permanent status, as will vertical construction, thereby calling for the deployment of specialized engineer units.

In any of the scenarios, the loss of the COMMZ engineer assets to combat missions prior to the arrival of the deploying Corps units will mean limiting health and sanitation requirements, less effective logistics bases, and mostly expedient combat engineer work in the forward areas.

D. Command, Control & Communications Considerations - C³

"The command and control system is the exercise of command, the means by which campaigns and battles are planned and directed. Its essence is leadership, decision making, the issuing of orders, and the supervision of operations."²¹ To accomplish these, the commander must have adequate communications capability. Before we go further, however, a few words concerning command relationships in our area of interest are in order.

The role of U.S. forces in a NATO or Korea contingency is one of collaboration. The host nations have forces of their own that are charged with defense of their homeland, and they will have a great deal to say about how that is done. In Europe, the combine of NATO nations must meet and concur before any operation of major scale commences. In Korea, U.S. forces are in a combined force arrangement with an obviously strong and capable ROK Army that operates under its own chain of command. Command and Control relationships for U.S. forces in our selected area of operation are complex, somewhat duplicative, and will become very tenuous in an actual combat environment. We have paid little heed to the principle of simplicity or to Clausewitz's advice:

Everything looks simple; the knowledge required does not look remarkable, the strategic options are so obvious that by comparison the simplest problem of higher mathematics has an impressive scientific dignity . . . The military machine - the army and everything related to it - is basically very simple and therefore seems easy to manage. But we should bear in mind that none of its components is of one piece: each part is composed of individuals, every one of whom retains his potential of friction . . . Once war has actually been seen the difficulties become clear; but it is still extremely hard to describe the unseen, all-pervading element that brings about this change of perspective.²²

The organization and command relationships for U.S. forces in our particular part of the globe are shown in Figure 6. All U.S. Armed Forces in the Pacific are under the Commander in Chief, Pacific (CINCPAC). Operational command of forces assigned to the Pacific Command (PACOM) is exercised through the CINCPAC component commands and subordinate unified commands. The CINCPAC Army component command is the U.S. Army Western Command (WESTCOM). Operational control of contingency forces will be assigned to the subordinate unified

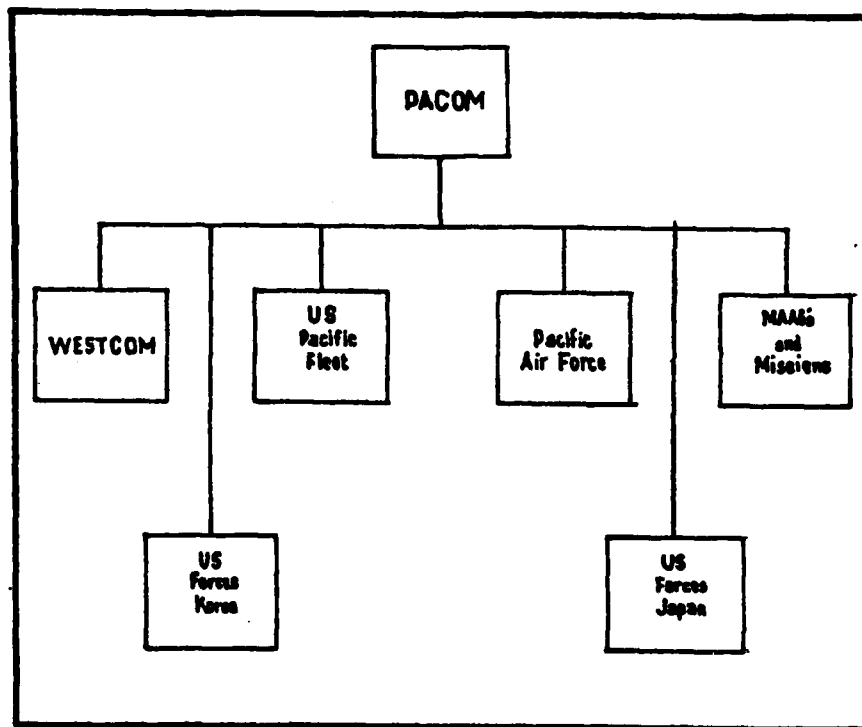


FIGURE 6. PACOM ORGANIZATION

commanders in Korea, and they will be responsible for the coordination between respective Allied forces and U.S. forces in operations and support.

United States forces in Korea are part of a command structure which has developed since the Korean War. The three major commands in Korea are the United Nations Command (UNC), United States Forces Korea (USFK), and Combined Forces Command (CFC). The command relationships are shown in Figure 7. The Commander of U.S. Forces in Korea (COMUSK), a subordinate unified command under CINCPAC, exercises operational command over Eighth U.S. Army, US Naval Forces Korea, and US Air Forces Korea. The chief instrument for the defense of Korea is the Combined

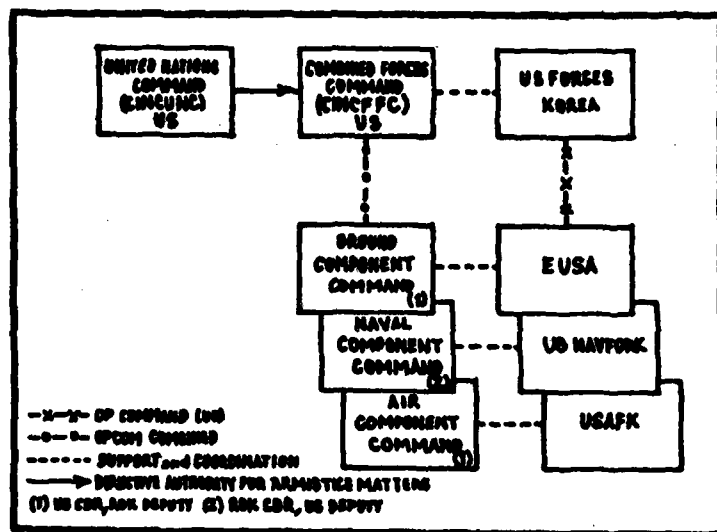


FIGURE 7. COMPONENT COMMANDS IN ROK

Forces Command. Commander in Chief, Combined Forces Command (CINCCFC) exercises combined operational command and/or control over all forces defending Korea.

The CINCCFC exercises operational command of committed forces in peacetime. "The CFC receives its strategic direction and operational guidance from a US-ROK Military Committee. The committee receives its strategic direction and guidance from the national command and military authorities (NCMA) of the two countries. The Commander in Chief of the United Nations Command, who retains sole authority for the implementation of the Armistice Agreement, has directive authority over CINCCFC for Armistice Agreement matters . . . CINCCFC has the mission of actually defending the ROK."²³

The CINCCFC exercises combined operational command through ground, air and naval components. The peacetime ground component command relationships are shown on Figure 8. This command relationship structure is designed to provide for the combined defense of the ROK while insuring that the CINCUNC's armistice responsibilities are also fulfilled. These command relationships, coupled with the language difficulties,

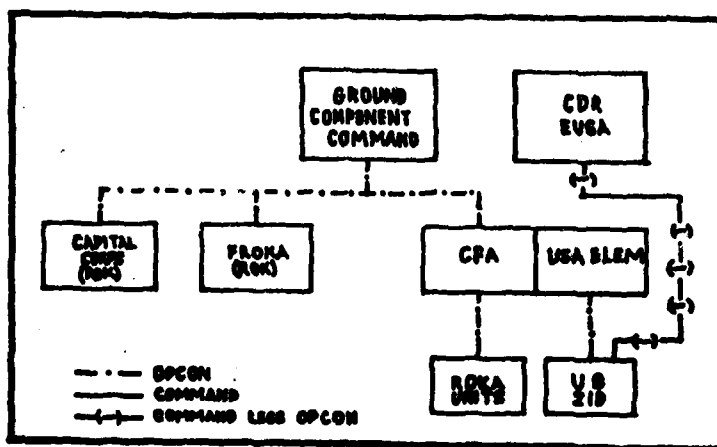


FIGURE 8. GROUND COMPONENT COMMAND (PEACETIME)

will present a formidable challenge to any tactical commander who must also worry about command and control relationships of his subordinate units.

Our research revealed that the initial perception in Korea was that US forces will not have the lion's share of control over operations conducted in response to one of the scenarios covered in this report. We have few forces and will have to copiously observe all amenities while working in the CFC operational mode in order to guarantee the best possible outcome for US units and our national interests. Much of what US engineers can do, especially in road and airfield repair and maintenance, and general engineering, in the Corps forward areas is dependent upon the capabilities and good intentions of the engineer assets of the ROK. Close and effective coordination with them is especially vital since their efforts to the rear of US divisions is intended to release US engineers for combat engineer missions in the most forward areas.

While the CINCPAC and CFC go about effecting command and control at their levels, engineer commanders in the field will be trying to effect the best possible C³ under existing concepts. Divisional engineers have the capability and can be responsive to division and brigade commanders through close and continuous operations, knowledge of standing operating procedures (SOP's) and common means of communications. The most tentative part of C³ within a division area will be the arrival - after the onset of hostilities - of elements of a Corps engineer brigade. The initial feeling-out and distribution of responsibilities will have to take place in an atmosphere of openness and good faith. If not, unnecessary friction can develop to the detriment of tactical missions.

The Corps engineer brigade commander must initially receive advice and instructions from the division engineer battalion commanders until he becomes familiar with the operations and terrain to act with real confidence.

The method of handing-off tasks in a changing situation will require mutual trust, cooperation, and responsiveness, with the ultimate accomplishment of the mission taking precedence over matters of rank or "turf." And if we as engineers believe that our units are most effective when we control them, then it behooves us to insure that the tactical commander is able to perform in battle because of engineer capabilities, not in spite of them!

The requirement for Corps engineer battalions and companies to move laterally over considerable distances to accomplish engineer tasks in direct support of combat units adds to the need for timely and realiable C³ measures and procedures. Corps and battalion engineer commanders must rely heavily upon Army aviation resources to move around the area of operations and supervise the far-flung engineer units. Of even more immediate urgency is the need for more expedient ways of "checking into the net" once Corps engineers arrive in the theater.

A further concern is the phased deployment of Corps engineer units from CONUS. Some numbered companies and combat engineer battalions will arrive in advance of group and brigade headquarters. Engineer units already in country must be ready to effect planned reception of such units in order to get them operationally employed at the earliest possible time. The C³ concerns connected with "jumping on a moving train and being ready to work as soon as you find

your seat" are the subject for a study in themselves. At this point it suffices to say that the complexity of C^3 relationships in our perspective area of operations will add to the friction and fog of war.

CHAPTER IV

FOOTNOTES

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18. Canby, pp. 10-12.
19. "Clausewitz--On War," pp. 119-121.
20. "FM 100-5," pp. 2-1, 2-2.
21. Ibid., p. 6-2.
22. "Clausewitz--On War," p. 119.
23. "FM 100-5," pp. 17-16 thru 17-24.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this chapter is to briefly summarize major study findings, conclusions, and offer some recommendations. These will be presented in an integrated format - making no attempt to deal with detailed specifics.

This study has attempted to focus on the northeast Asia contingency. It employs as a vehicle three different tactical scenarios and attempts to address the employment of the Engineer System in each, as it influences mobility, countermobility, survivability, and general engineering tasks. This approach was found to be very valuable and is recommended for future development and refinement.

The study contains considerable information and historical perspectives on the chosen area of operations (Korea) and is recommended, as a start point, to all Light Contingency Corps engineers. It provides some appreciation of the terrain, climate, people, transportation, and historically revisits the Korean War to learn or relearn old lessons. The authors consider this an invaluable experience with long lasting benefits.

Our research revealed that emphasis and doctrine on the use of Army aviation by engineers is lacking across the board. In today's fluid and highly mobile battlefield it would prove imprudent and

undesirable for this neglect to continue. The Engineer Family collectively must allocate sufficient resources to correct this visible deficiency. This effort must include required capabilities, training, planning and control considerations.

The authors have also concluded that the major handicap confronting the Corps engineers is accomplishing their mobility, countermobility, and survivability missions in their limited integral mobility. They will find it difficult to accomplish the many engineer missions dictated by the newly adopted Air Land Battle doctrine. The Army must get serious about this shortcoming and apply the necessary resources to correct it - it must be treated as a war stopper variable with the potential of degrading the improved effectiveness of the tactical units.

The Corps engineers must learn to cope with a highly complex and complicated command and control system. They can't wait until deployment date to become knowledgeable of the various intricacies of the system. They must become knowledgeable now and work out detailed coordination and command relationships necessary for efficient operations during combat. The Corps engineers are further hampered in this vital area by the lack of adequate or compatible communications equipment. Much work remains to be done in this area at all levels.

The need for a simple, but effective, prioritization scheme for engineer effort became evident very early in this study. The prioritization scheme discussed in Chapter IV is offered as a possible candidate. It has the potential for automation, and is flexible enough to address any contingency or given scenario. This would be a fruitful area for further study.

The basic objective of this study was to provide initial information on the employment of the Engineer System in a northeast Asia contingency. From this, it is hoped that stimulus for further and more detailed research be generated. Any of the major areas discussed above could prove an invaluable study, and contribute greatly to the Engineer Family.

CHAPTER VI

ADDITIONAL CONSIDERATIONS

As stated in the introduction of the report, this study was undertaken as an initial effort and with limited scope. No attempt was made to discuss any detailed requirements for force structure, equipment, or actual contingency operational deployments.

During our historical research, it became clearly evident that these matters had been looked at before in much detail. Considerable historical literature exists which can be of great assistance to the planners and combat developers. Although not specifically referenced in the body of the report, these references were instrumental in the authors' overall perspective and approach for this study. So that this effort not be completely wasted the authors offer an added Bibliography at the conclusion of this report. It is hoped that those aspiring to do follow-up studies, in any of the areas discussed in the previous chapter, may find this of some assistance.

The authors were also impressed with the enormous volume of valuable information contained in these historical documents, but saddened by the fact that its use is neglected. Our mentality is geared towards recreating the wheel. If we take some time to learn from the lessons of history before we rush into the next conflict it will not mean that we fight the last war all over again, but to learn not to make the same mistakes.

As we proceed with our endeavors to develop ever more sophisticated engineer equipment and organizational structures, let's not forget that some combat multipliers do not have to be all that expensive. The commander's thorough knowledge of the area of operations, to include geography, terrain, climate, and the people has proven in the past to be a combat multiplier. The ghosts of Alexander, Caesar, Napoleon and Frederick the Great say it is so. History is also replete with examples where lack of knowledge degraded combat capability.

FINIS

To complete this study the following statement by Dr. Freeman encapsulates the true purpose of what we have attempted to say.¹

. . . But never lose the idea of the ultimate offensive, and never take any adventure in leadership that doesn't look in the end to the attainment of your objective with the least losses. I watched the Marines go up there in that Changjin reservoir area along with the 17th Regimental Combat Team and with that 31st and 32nd Regiment. God alone knows why they were ever sent there. I can't imagine but one reason, and that must have been to reach the frontier so that they could sweep westward, to clear the frontier and break up the left flank of the enemy in front of the rest of the Eighth Army. I can't think of any other reason. And I watched them - I watched them come down. And the heartbreak! And I saw in the midnight hours the faces of some of those junior officers to whom through the years I had lectured at Quantico. I saw them there. And I said, "They got down by discipline, guts and leadership. That's how they got down. And that's how many of us in like difficulties will get down to start again and fight again." No matter how much of that you may have, no matter how great those difficulties, it is history that teaches this nation that bids us take courage and strike a blow when you can!

CHAPTER VI

FOOTNOTES

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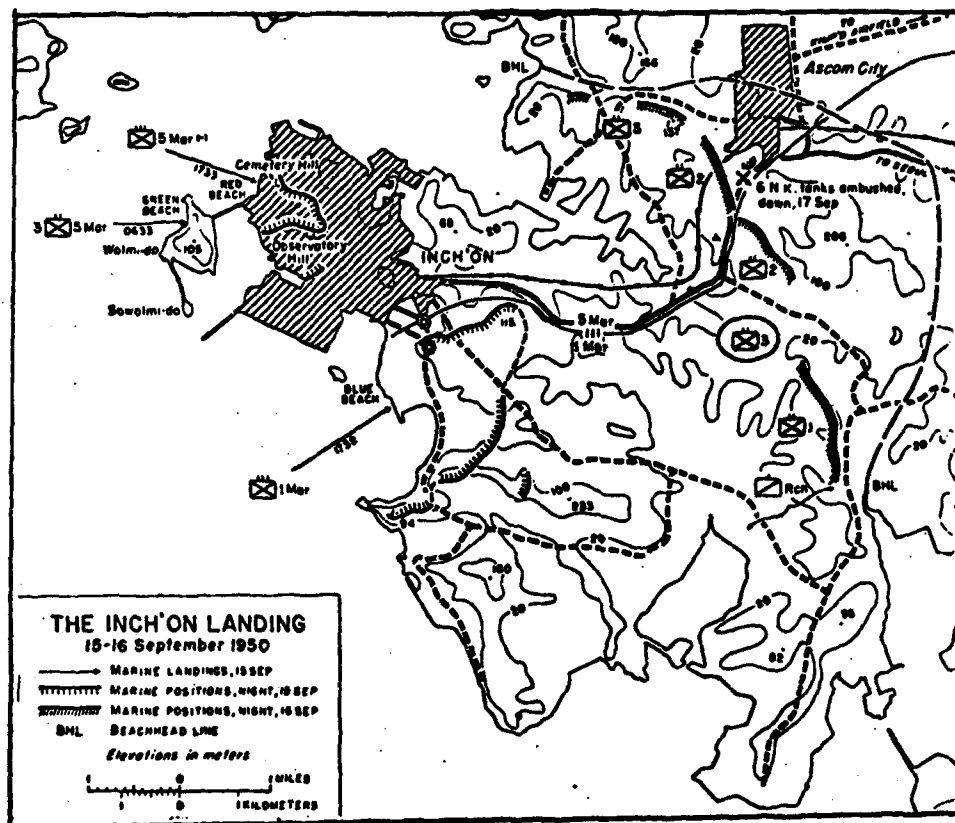
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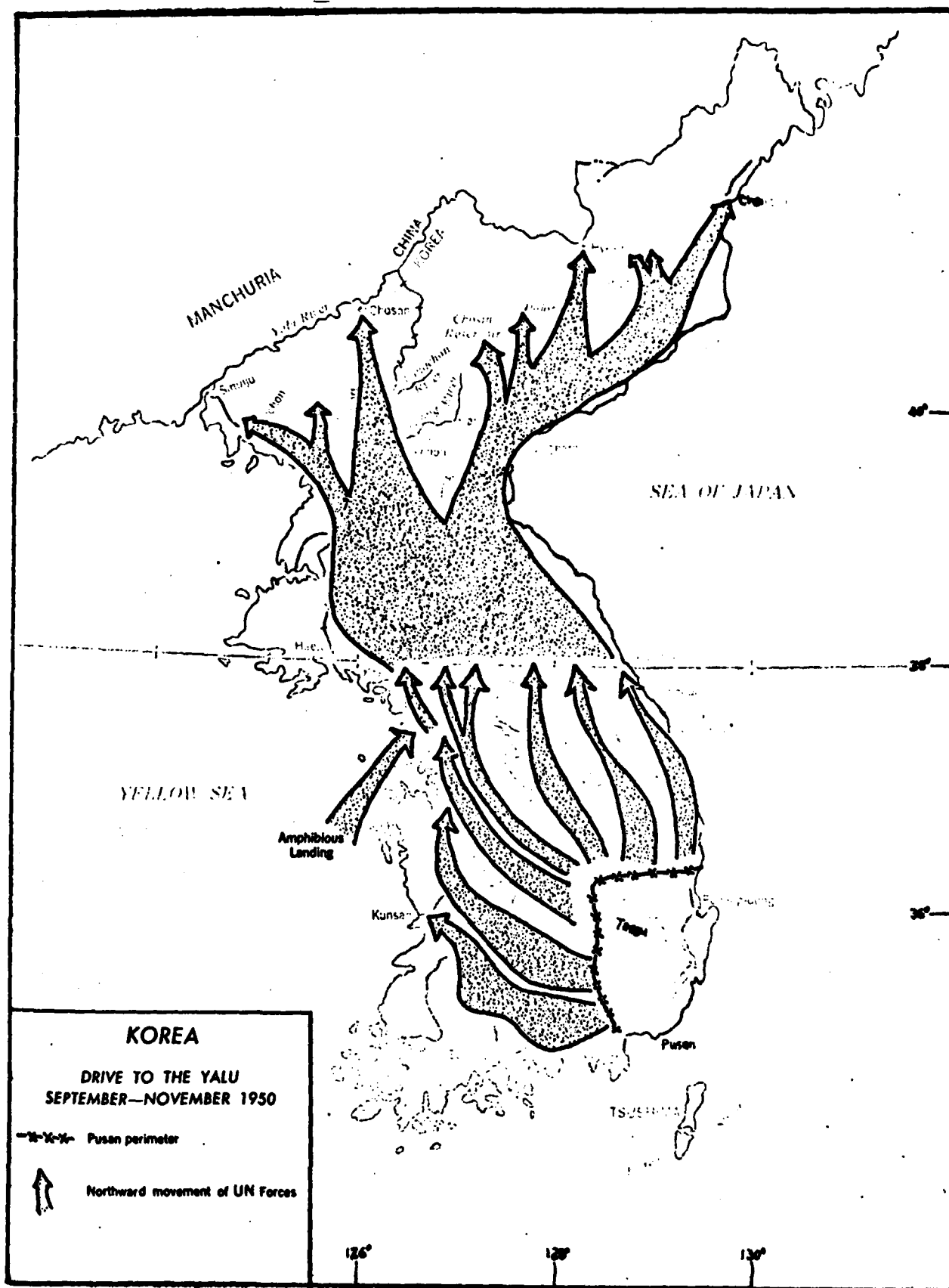
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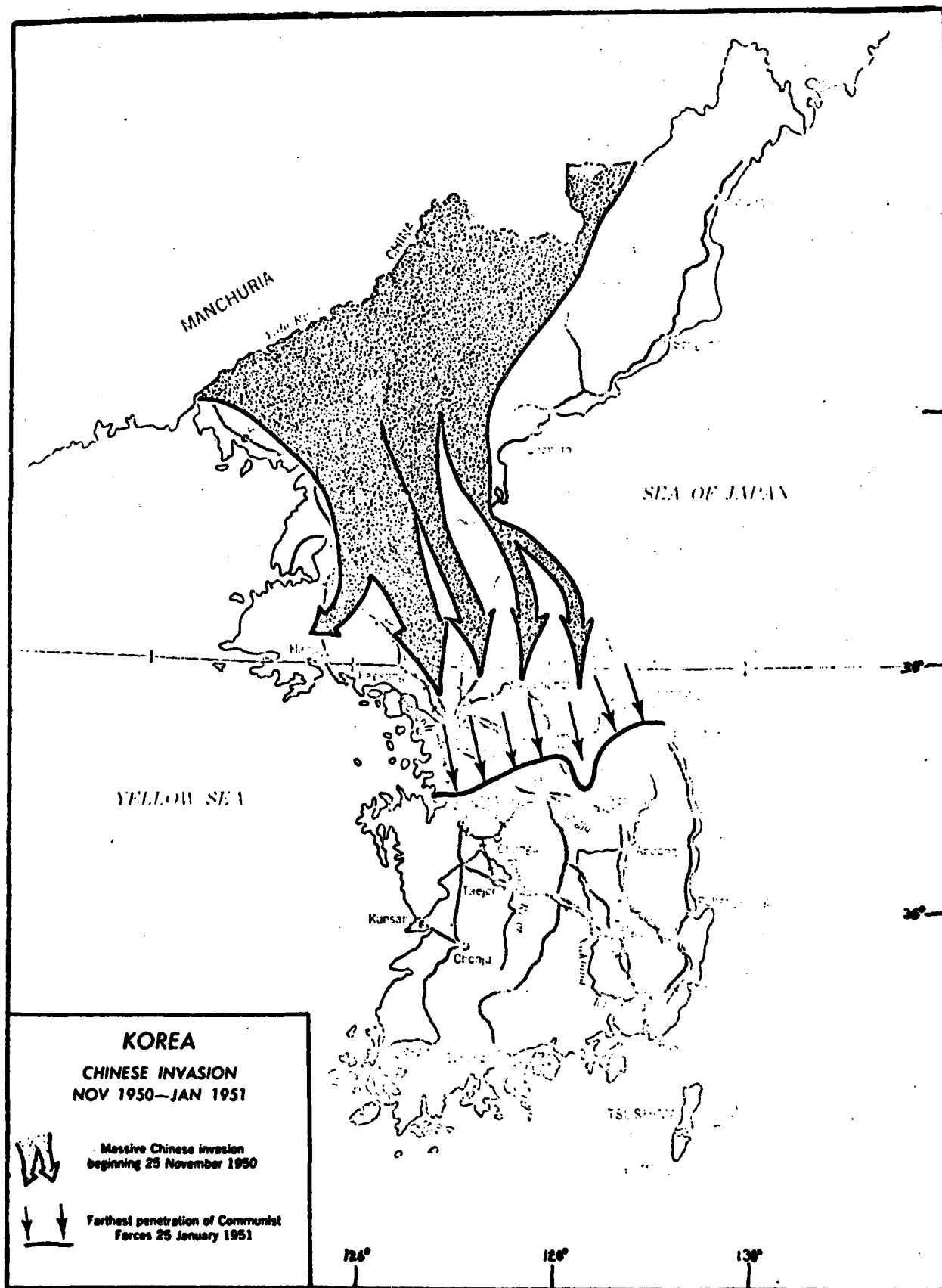
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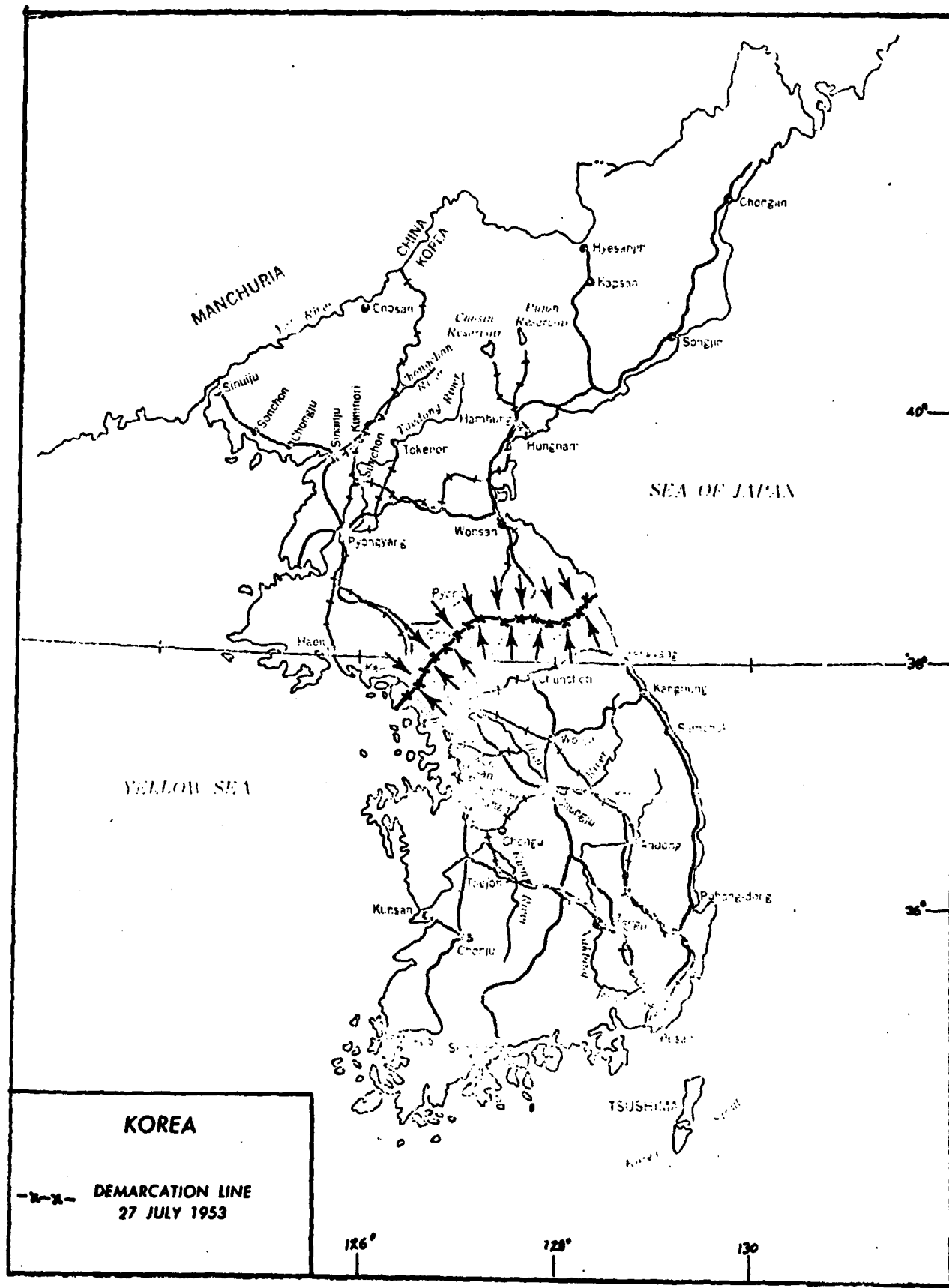
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APPENDIX I
MAPS OF KOREA









APPENDIX II

KEY KOREAN WAR BATTLES
AND
PICTORIAL HISTORY

KOREA ON MAPS

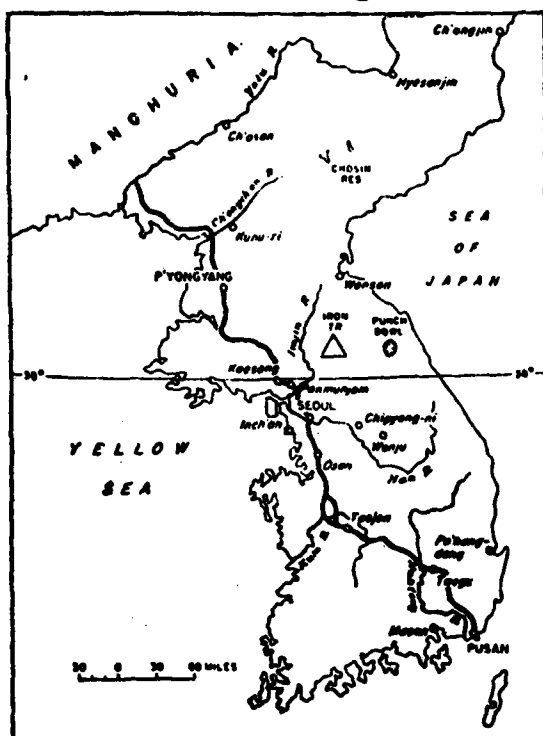
Limited in resources and, ultimately, objectives, the Korean War involved several million men in a bitter struggle of conflicting ideologies. At peak strength the United Nations forces in the field totalled almost three quarters of a million men—about 400,000 South Koreans, 250,000 Americans, and 35,000 of other nations. In the three years of combat, UN forces sustained not quite half a million casualties. North Korean and Chinese Communist losses are estimated at two million men.

In addition to the sizable U. S. and ROK forces engaged, nations contributed ground troops to UN forces as follows: two United Kingdom brigades and one Canadian brigade—forming the 1st Commonwealth Division; Turkey—one brigade; Australia—two infantry battalions; Thailand, the Philippines, Colombia, Ethiopia, France, Greece, Belgium, the Netherlands—one infantry battalion each; New Zealand—one artillery battalion; Luxembourg—one infantry detachment; India, Denmark, Sweden, Norway, Italy—medical units. Some of these nations and others furnished naval and air contingents.

The phases of the war, the push and pull up and down the Korean peninsula, the alternating tides of fortune, are portrayed in the following pages of text and maps. The text is by Major Martin Blumenson, USAR, a historian in the Office of the Chief of Military History, Department of the Army. The maps are the work of Major B. C. Mossman, USAR, a cartographer in the Office of the Chief of Military History, Department of the Army.

KOREA ON MAPS

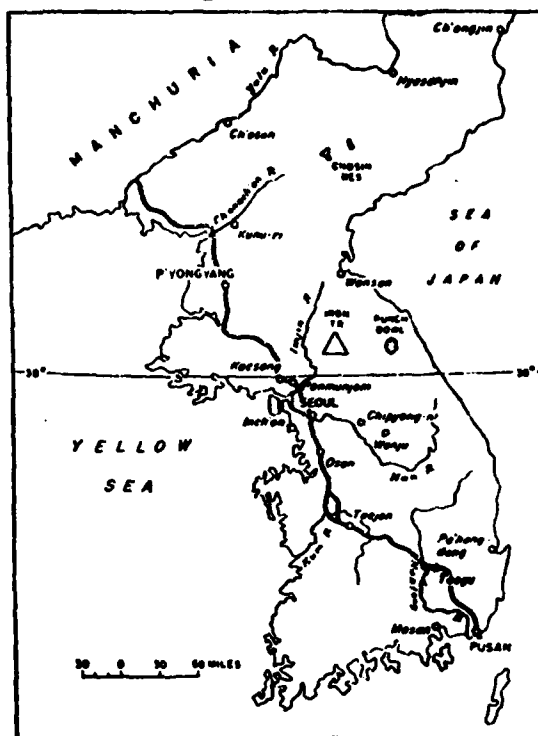
Communists invade South Korea...drive south...Pusan Perimeter holds...MacArthur's



OUTBREAK OF THE WAR

25 June to 13 July 1950

North Korean troops crossed the 38th parallel early on 25 June, and three major columns, the main one striking toward Seoul, invaded the Republic of Korea. The United Nations Security Council denounced the aggression, and two days later requested assistance to restore peace. President Truman ordered U. S. air and naval forces to support the ROK, then authorized use of ground troops, air bombardment of military targets in NK, and a blockade of the coast. Though gallant ROK defenders had temporarily held up the central thrust, elsewhere the ROK army was overwhelmed. Seoul fell on 28 June, and ROK troops streamed southward in retreat. The U. S. 24th Division reached Korea from Japan, Task Force Smith (21st Infantry) making initial contact on 5 July with the enemy near Osan, 30 miles south of Seoul; then it fought delaying actions as the NK pushed south. The 25th Division arrived. Upon UN Security Council request, Truman appointed Gen. Douglas MacArthur Commander in Chief of the UN Command. By 13 July the North Koreans had overrun half of South Korea.

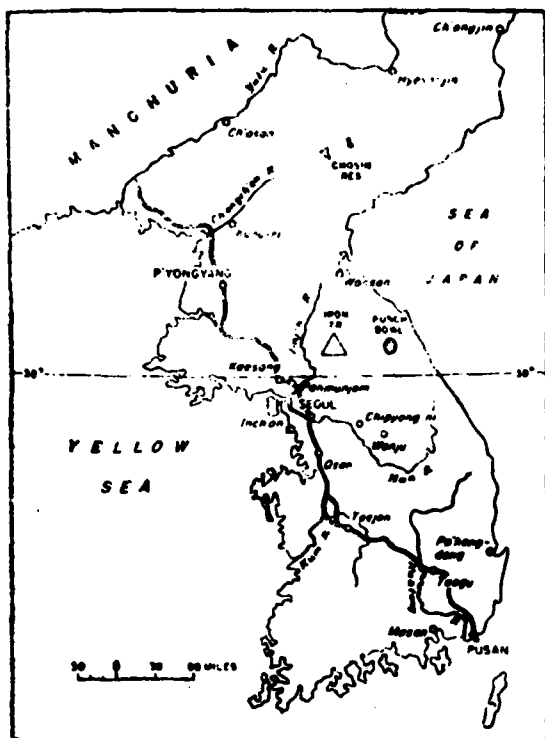


PUSAN PERIMETER

14 July to 14 September 1950

While U. S. personnel of KMAC worked to reconstitute the ROK Army (reduced to less than half its original 100,000 men), UN forces made a stand at the Kum River, lost Taejon on 20 July, withdrew toward the Naktong. Holding the southeast corner of Korea, so desperately short of troops that South Koreans augmented U. S. Army units in the KATUSA program, the UN forces fought a magnificent defensive battle. Three areas were critical: Pohang-dong, 63 miles north of Pusan on the east coast; Taegu, 55 miles northwest of Pusan on the main highway from Seoul; and Masan, 29 miles west of Pusan on the southern shore. Controlling additional forces—five ROK divisions, the 1st Cavalry Division (arrived 18 July), 20th Infantry RCT (from Okinawa, 26 July), 5th Infantry RCT (from Hawaii), 2d Infantry Division and 1st Provisional Marine Brigade (from the U. S.), Walker shifted units to close off enemy penetrations. The British 27th Commonwealth Brigade arrived from Hong Kong and replaced the Marines, shipped to Japan for a pending operation. By mid-September, despite continuing NK pressure, EUSAK firmly held Pusan.

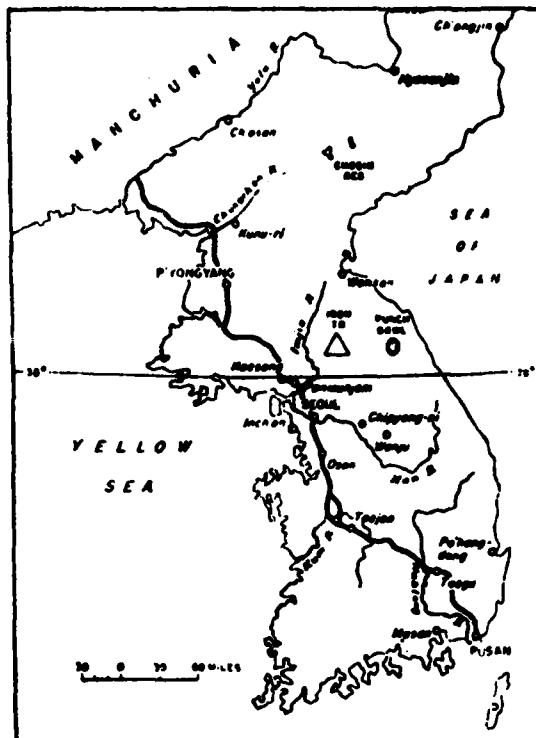
left hook at Inchon...North Korean Army destroyed...drive to north...Chinese intervene



SOUTH KOREA CLEARED

15-30 September 1950

While EUSAK fought the battle of the perimeter, MacArthur prepared an amphibious assault on Inchon to cut the main NK line of communications. Troops of the 1st Marine and 7th Infantry Divisions, under Lt. Gen. Edward M. Almond's X Corps, began to come ashore on 15 September. Next day Walker launched a breakout attack from the perimeter. The ROK I and II Corps drove north, Lt. Gen. Frank W. Milburn's I Corps advanced northwest along the main highway to make contact with X Corps; later Lt. Gen. John B. Coulter's IX Corps advanced westward to clear the southwest corner of Korea. Outflanked at Inchon, their main communications severed, squeezed from the south, the NK forces disintegrated. On 26 September, as the Inchon and Pusan forces made contact, UN forces recaptured Seoul. Reinforced by a battalion each of Filipino and Australian troops, with the 3d Infantry Division and a Turkish brigade soon to arrive, UN forces cleared South Korea of the enemy. By the end of September, ROK troops on the east coast again stood at the 38th parallel, while other units were driving toward it without difficulty.

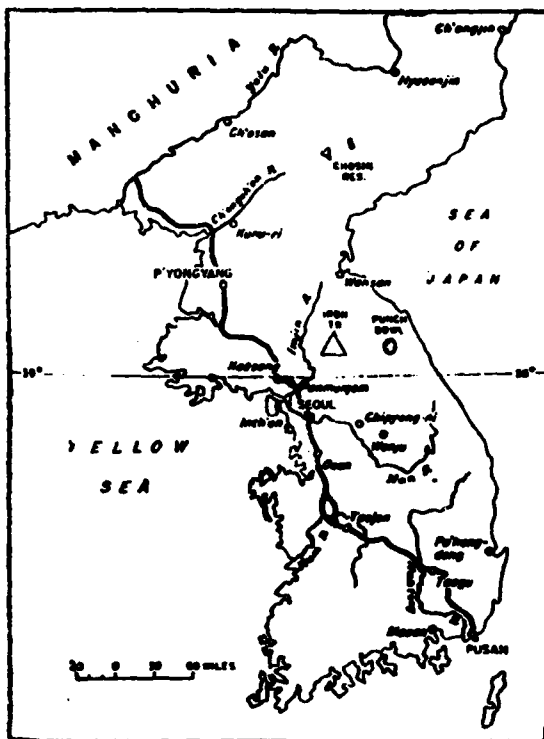


DRIVE TO THE NORTH

1 October to 25 November 1950

Given authority on 6 October to pursue the defeated Reds across the 38th parallel and destroy them, UN forces drove north. The ROK I Corps advanced up the east coast. X Corps embarked at Inchon and Pusan for another amphibious assault. EUSAK's I Corps entered Pyongyang on 19 October. The 187th Airborne RCT dropped 30 miles beyond. ROKs reached the Yalu at Chosun on 26 October. X Corps landed on the east coast and pushed toward the Yalu. By the end of October the NK army had dissolved; 135,000 prisoners had been taken. But Chinese troops were striking overextended UN units. Though EUSAK consolidated along the Chongchun, X Corps reached the Yalu at Hyesanjin, ROK I Corps pushed into the north-east corner of Korea 60 miles from Siberia. The British 29th Commonwealth Brigade, a battalion from Thailand, and South African air units arrived in Korea. Victory seemed at hand when MacArthur announced on 24 November the final drive to the northernmost limit of the Korean peninsula. But within 24 hours the situation was to change with devastating suddenness.

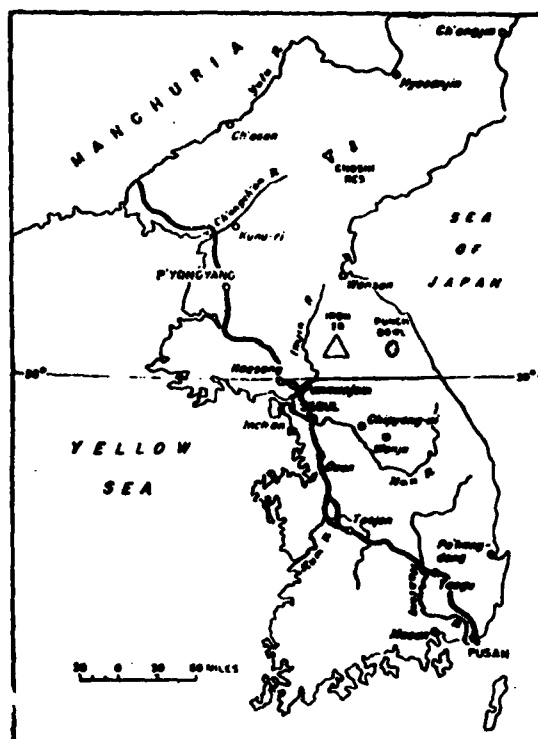
Eighth Army establishes a new line...Ridgway orders "Killer" offensive...Chinese



UNITED NATIONS RETREAT

25 November 1950 to 24 January 1951

The "entirely new war" opened 25 November when Chinese Communist forces struck and crushed ROK II Corps on the EUSAK right, next to the mountains separating it from X Corps. Two days later the CCF attacked X Corps around Chosin Reservoir, main EUSAK forces on the west coast, thereby threatening both with encirclement. EUSAK retired overland, covered by action at Kunu-ri, and established defenses below the 38th parallel to protect Seoul. X Corps fought a heroic 13-day battle to the east coast for seaborne evacuation along with ROK I Corps to Pusan. X Corps came under EUSAK, commanded by Lt. Gen. Matthew B. Ridgway after Walker's death on 23 December. Dutch, Greek, Canadian and French infantry battalions and New Zealand artillery augmented the UN forces. Pushed back again by the Chinese in their New Year's offensive, the UN lost Seoul on 4 January, Wonju during mid-month. When the CCF ran out of gas, Ridgway, with EUSAK's three U. S. corps on the left and the ROK army on the right, was ready to pass over to the attack.

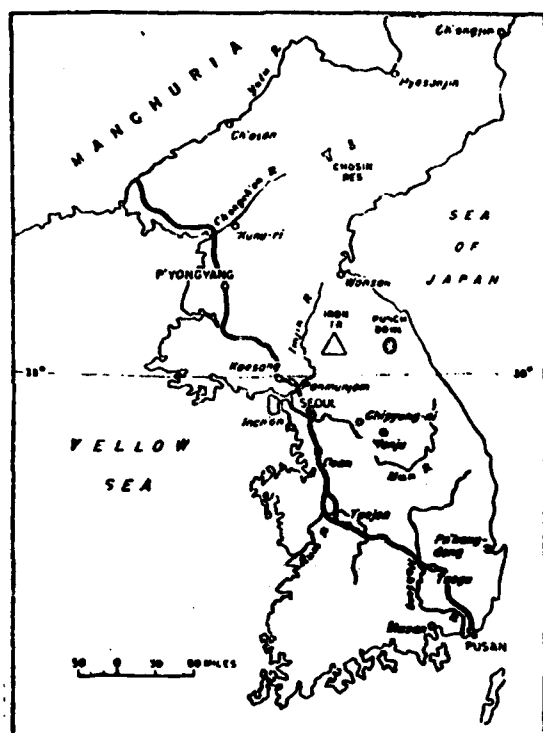


UNITED NATIONS OFFENSIVE

25 January to 21 April 1951

Ridgway's offensive, designed to damage the enemy rather than gain real estate, was a methodical, limited advance along a solid front developed from a reconnaissance in force into full-scale attack. Operations Thunderbolt, Killer, Ripper and Rugged carried the UN forward. By 10 February forces on the left had taken Inchon and were within striking distance of Seoul. Forces in the center captured Wonju and were probing northward when the enemy struck in two places. The enemy reaction bent back the front and surrounded for three days the 23d Infantry (2d Division) and its attached French battalion at Chip'yong-ni, where an outstanding action was fought. Enemy pressure relaxed along the front by 19 February, and UN forces again advanced. A drive up the center outflanked Seoul, which came into UN possession again on 15 March. An airborne assault on 28 March by the 187th RCT 20 miles northwest of Seoul proved the enemy in retreat. Ridgway succeeded MacArthur as CINUNC on 11 April, Lt. Gen. James A. Van Fleet becoming EUSAK commander. UN forces were advancing north of the 38th parallel virtually unopposed.

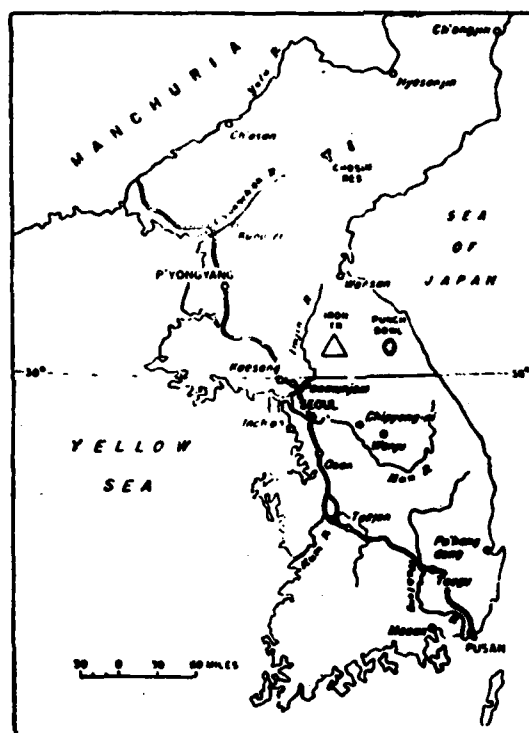
attacks repulsed...United Nations counter-attack...drive enemy above 38th Parallel



CHINESE SPRING OFFENSIVE

22 April to 19 May 1951

The Chinese attacked during early evening of 22 April, and cracked the UN line in the center, near Hwachon. Rather than expend his troops in a defensive stand, Van Fleet ordered a step-by-step withdrawal to permit the full force of artillery and air to be brought against the enemy. A battalion of the British 29th Brigade, isolated and virtually overrun on 23 April, fought a gallant battle. Though Van Fleet had hoped to anchor his withdrawal on Line Kansas, a series of positions across the Korean peninsula generally just above the 38th parallel, enemy pressure pushed the UN south of the parallel after a week. The Canadian 25th Brigade arrived to bolster UN forces. The enemy rested, then launched a second offensive on the night of 15 May, pushing back the UN right, striking on 17 May on the UN left. Putting out thousands of tons of artillery ammunition in what came to be called "the Van Fleet load," EUSAK stabilized the front. By 19 May the enemy was at a standstill, and it was the UN's turn to take up the offensive.



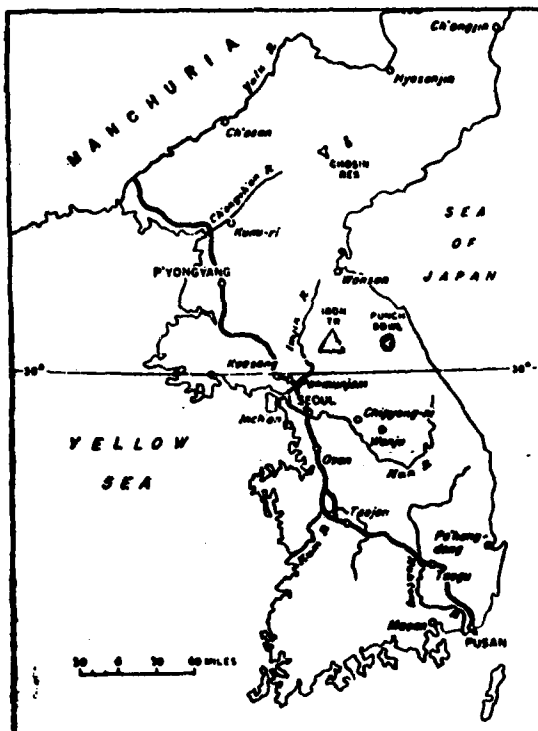
UNITED NATIONS COUNTEROFFENSIVE

20 May to 23 June 1951

Against generally light resistance the UN forces rolled forward. By the end of May the front was practically back on Line Kansas, and South Korea was again virtually cleared of enemy troops. Though the Joint Chiefs of Staff had limited EUSAK to the general vicinity of Kansas, local advances to gain more favorable ground were permissible. Van Fleet therefore ordered Kansas strengthened on 1 June, while at the same time he directed attacks toward the Iron Triangle in the center and toward the Punch Bowl in the east. Though troops for the most part developed defensive lines, patrolled, and engaged in local skirmishes, violent action developed in these two areas, with the result that Van Fleet designated Wyoming in the Triangle area, along with Kansas elsewhere, as the main line of resistance. As the first year of conflict drew to a close, the fighting diminished, stalemate appeared, and political settlement began to seem preferable to military victory. When the USSR delegate to the United Nations proposed on 23 June a cease-fire in Korea, EUSAK was well above the 38th parallel and ensconced on favorable terrain.

KOREA ON MAPS (concluded)

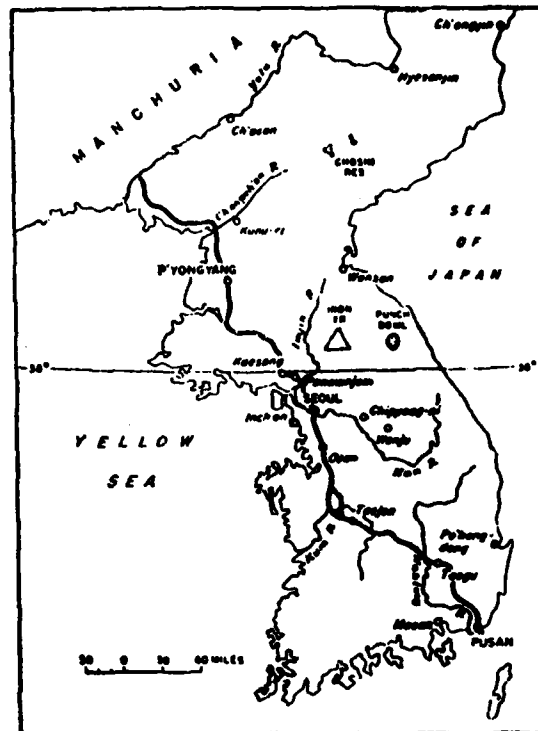
Truce talks begin . . . stalemate . . . truce—after 37 months of bitter limited conflict



LULL AND FLARE-UP

24 June to 11 November 1951

With the Chinese indicating an interest in a truce, President Truman authorized Ridgway to negotiate with the enemy military command. Meetings began on 10 July at Kaesong with the understanding that hostilities were to continue until the armistice was signed. Yet neither side wished all-out warfare while peace talks progressed, and the fighting decreased in intensity. The troops improved positions, consolidated ground, exchanged artillery fire, tried to capture prisoners, raided, and patrolled. A battalion each of Colombian, Belgian and Ethiopian troops joined the UN forces. The two British brigades and the Canadian came together to form the British 1st Commonwealth Division. In August the truce talks broke down. Late that month the Battle of Bloody Ridge commenced. It developed eventually into the Battle of Heartbreak Ridge, which did not end until 14 October. Ridgway persuaded the enemy to reopen negotiations at Panmunjom on 10 October, but a misdirected UN air attack interrupted the meetings. Late in October negotiations finally resumed. Yet the fighting, though subdued, continued.



STALEMATE

12 November 1951 to 27 July 1953

On 12 November, Ridgway ordered Van Fleet to cease offensive operations. Warfare devolved into raids, local limited attacks, combat patrols, artillery fire. UN forces established outpost positions to screen the main defensive line, and sharp skirmishes occurred. Two National Guard infantry divisions (45th and 40th) arrived during December 1951 and January 1952, and the 1st Cavalry and 24th Infantry Divisions returned to Japan. Van Fleet retired in February 1953, and Lt. Gen. Maxwell D. Taylor became EUSAK commander. As the armistice negotiations entered their final and decisive phase in May, the enemy stepped up the action. Twice hostile forces struck, once in mid-June, again in mid-July, to erase bulges in the front. The UN forces recoiled, lost a few miles of ground, but inflicted great losses. The negotiators reached agreement on 19 July, signed the armistice on 27 July, and on that day, though the opposing forces remained in place, the warfare that had ranged up and down the Korean peninsula for 37 months ceased and perhaps came to an end.



EAGO-MH

DEPARTMENT OF THE ARMY
HEADQUARTERS, EIGHTH UNITED STATES ARMY
APO SAN FRANCISCO 96301

FAMOUS KOREAN WAR BATTLE SITES IN SOUTH KOREA
(in chronological order)

1. Task Force Smith at Osan, 5 July 1950. Unit: Battalion combat team from 21st Infantry Regiment, 24th Infantry Division.

Task Force Smith, comprised of elements of the 24th Division's 21st Regiment, then based in Japan, was the first American unit to fight in Korea. The initial 406 members of Task Force Smith arrived at Pusan by air on 1 July 1950 and were rushed north by train and truck. On 4 July they were joined at Pyongtaek by 134 men of their division's 52d Field Artillery Battalion which had crossed from Japan on an LST. Near Osan, on the rainy morning of 5 July, the infantry and artillery contingents of Task Force Smith engaged 33 Soviet-made T34 tanks and a regiment of North Korean infantry in a bloody six-hour battle. Though hopelessly outnumbered, they acquitted themselves nobly and, before withdrawing to Taejon, inflicted heavy losses on the enemy. The 540-man American Task Force suffered 150 casualties in dead, wounded and missing. Today, on a tree-covered hilltop at Chukmi-Ryung, near Osan, stands an obelisk commemorating the battle at Osan. The monument was erected in 1954 by the 24th Infantry Division, then based in Korea.

2. Taejon Defense, July 1950. Unit: 24th US Infantry Division.

After Task Force Smith had fought its way out of impending encirclement near Osan, the 24th Division fought successive holding actions at Chonan, Chonui and Chochiwon and south across the Kum River to the important town of Taejon. It was a natural location for a determined stand by US troops since it is an important communications center and is at the head of a highway and double-tracked railroad which twists through the mountains to Pusan, 125 miles to the southeast. To protect Taejon, the thinning ranks of the 24th Division were deployed between the town and the Kum River. Engineers blew the bridge crossing the Kum but, unfortunately, the waters of the river subsided and the enemy was able to ford the river at several places. On 13 July, before the battle for Taejon began, LTG Walton H. Walker, CG of the Eighth Army, had assumed command of all ground forces in Korea. He wanted to hold Taejon, but once the Communists forded the shallow Kum, the fate of the city was decided. Nevertheless, the battle for Taejon was bitter. There were neither weapons nor troops enough to hold the Communists. In the west, probing attacks were launched by the enemy up and down the Kum and he established footholds across the river at Sangyo-ri and Kongju. After the Communists forded the Kum they

poured into the vicinity of Taejon. Lacking the reserves to defend its flanks, the bulk of the 24th was ordered to retreat before it was completely surrounded. A fierce rear guard action was fought in and near the city as the North Koreans appeared on every side. In baggy white civilian clothes or American fatigue uniforms, Communist soldiers who had infiltrated Taejon at night rained death upon the Americans, as they fought to hold off the enemy's frontal assault. Other North Korean units cut in behind the city, blocking the escape route which US forces could not keep open because of a failure in communications. Among the men lost in this battle was the 24th's commander, General Dean, who remained with his forward units in Taejon when the North Korean tanks broke through. This fearless officer was in the midst of the fighting reassuring the disheartened, reorganizing men separated from their units, participating in attacks against enemy tanks, and directing aid to the wounded. For his gallant deeds at Taejon, General Dean was awarded the Medal of Honor. The three days of desperate fighting by General Dean's command at Taejon constituted the strongest resistance encountered by the enemy to that date.

3. Chinju Offensive, August 1950, specifically the battle for Masan.
Units: 25th US Infantry Division and 1st Provisional Marine Brigade composing Task Force Kean.

By 4 August the final tightening of defensive positions and shortening of lines was accomplished. American units had withdrawn across the Nakdong River, destroying its bridges as they went, and for the first time in the six-week old war a defensible line was established. From Masan on the south coast to the point of the Nakdong's junction with the Nam River some 25 miles above it, the 25th Division guarded the coastal approach to Pusan. The pressure against Eighth Army's left flank during August was a continuation of the attack the enemy had begun in July, when the North Korean 4th and 6th Divisions, after the fall of Taejon, had made an end run down the western coast of the peninsula turning east when they hit the beach town of Mokpo. The North Koreans concentrated the veteran 6th Division, east of Chinju, for an assault upon Masan and Pusan. Before the enemy jumped off, however, he was hit by Task Force Kean. Named for the commanding general of the 25th Division, Task Force Kean consisted of the 5th RCT, the 35th RCT of the 25th Division, the 1st Marine Brigade, and a ROK battalion. The 24th Regimental Combat Team of the 25th Division was held in reserve. The mission was to secure the left flank of the perimeter in order to prevent an enemy drive to Pusan. The force, on 7 August, opened a strong UN counteroffensive. Sharp engagements were in progress all along the 140-mile perimeter, and the attack by Task Force Kean at first met heavy opposition from an enemy which had even determined the location of the Marine command post. In their usual fashion the Communists infiltrated the UN positions and

raised havoc in the rear while the Army and Marine units fought their way up enemy-held mountain crests in temperatures which hovered at the 100-degree mark. Friendly artillery support, because of communication and other difficulties, was at first limited but Marine, Navy, and Air Force flyers cooperated magnificently to strafe and bomb the North Koreans' camouflaged positions. Enemy soldiers in civilian clothes nearly succeeded in turning the UN attack into a disaster by accurately spotting targets for North Korean guns. One large band of North Koreans appeared behind the advancing Americans and attacked two batteries of howitzers. The artillerymen, however, fought their 105's at point-blank range in a furious action which finally repulsed the enemy. Throughout 7 and 8 August the battle raged unabated. Despite the slow start, Task Force Kean made progress in the difficult job of ejecting the enemy from the mountain ridges. For most of these Americans this was an introduction to combat and the action was attended by severe losses in killed and wounded, as well as by a great many cases of heat prostration. The task force eventually overcame the North Koreans and, by 11 August, the high ground to the east of Chinju was again in friendly hands. Troops of the 35th RCT held their positions along the banks of the Nam River while the marines captured Kosong near the coast, the southeast of Chinju. Task Force Kean thus secured the left flank of the Eighth Army and, having created a deep salient in the enemy positions, forced the North Koreans to retreat, abandoning quantities of equipment. The Chinju counteroffensive proved to be an encouraging reflection of increased UN strength. From the point of view of morale, it was of incalculable importance. The threat to Masan having been reduced, which in turn safeguarded the approach to Pusan, General Walker was now able to shift some units to the Naktong River and others northward. The 1st Marine Brigade was released for duty along the southern portion of the Naktong front to fight beside the battle-worn 24th Division.

4. Naktong River Defensive, August 1950, specifically the battle for Tabu-dong. Units: 27th Infantry Regiment of the 25th Division; 1st ROK Division.

During the time that the enemy had tried to smash the UN line on the left flank at Chinju, a much larger force of Communists was battering at the Naktong River sector in an attempt to take the key city of Taegu. The ROK troops on the right of the 1st US Cavalry Division had been under intense pressure during this period. To bolster the boundary between US and ROK units, Eighth Army sent the 25th Division's 27th RCT, which was then in Army reserve, to Kyongsan, north of Taegu. The 27th RCT took positions along the road leading into Taegu from the north near the village of Tabu-dong, and it was in this area that the enemy struck. Indeed, he struck so many times down the poplar-lined dirt road defended

by the 27th RCT that this road became known as the "Bowling Alley." These "bowling ball" assaults were repulsed, but finally the enemy managed to penetrate along the boundary which separated the 27th RCT from the ROK troops on their right, and by 21 August there were 1,000 North Koreans to the rear of the 27th's positions. Eighth Army sent the 2d Division's 23d RCT in to clean them out which they did successfully. The 27th RCT, in defending Tabu-dong, handed the North Koreans their first resounding defeat of the war, and the US victory brought the 27th the personal congratulations of General Walker.

5. Inchon-Seoul Amphibious Landing and Liberation, 15-25 September 1950. Units: X US Corps, including the 1st US Marine and 7th US Infantry Divisions and attached troops.

The North Korean regime, which had counted on a quick and overwhelming conquest was given a stunning shock during the last two weeks of September: the US X Corps swept into Inchon from the Yellow Sea and the Eighth Army drove north from the Pusan Perimeter. This turn of events which led to the defeat of the North Korean divisions in South Korea was the culmination of General MacArthur's plan to cling to southeast Korea until sufficient reinforcements were concentrated in the Far East to permit an amphibious landing behind enemy lines. While the UN army fought along the Nakdong and Nam Rivers, the X Corps had been activated in Japan. Commanded by MG Edward M. Almond, the new organization in mid-August was given the mission of making an amphibious landing on Korea's west coast, and seizing Seoul and the communication routes over which enemy troops and supplies were traveling south. General MacArthur personally had selected Inchon for the landing since the difficult tides in that particular area might lead the enemy to expect an attack elsewhere--probably at Kunsan or Wonsan. Two US divisions, the 1st Marine and 7th Infantry, were assigned to the X Corps. The 1st Marine Division was formed in Japan by MG Oliver P. Smith who withdrew the 1st Marine Brigade from the Pusan beachhead and added to it six battalions which came from the United States, the Mediterranean, and shipboard units. MG David G. Barr filled out his US 7th Infantry Division, on occupation duty in Japan since 1949, with approximately 8,000 integrated South Korean soldiers. The necessary logistical build-up for the operation was effected in a remarkably short time and the main invasion fleet, commanded by Admiral Doyle, left Japan on 13 September. The actual landing, which took place on 15 September, had to coincide with the peak tides of that date in order to permit full maneuver of the fleet off Inchon. Unless the troops succeeded in landing during the limited period of favorable tides, it would be necessary to postpone the operation until October when once again abnormally high tides would pour over the mud flats, giving the required depth. UN planes provided strong tactical support

for a sudden counteroffensive launched by the Eighth Army along the Nakdong River. The battleship Missouri, rushed to Korea from Norfolk, Virginia, shelled Communist port installations on the east coast. At Inchon, airplanes and naval guns pounded the harbor defenses with rockets, bombs, and shells in preparation for the Marines' landing parties. While the more than 260 vessels of the UN invasion fleet maneuvered for position off Inchon, the bombardment against the beach defenses ceased and at 0630 on 15 September a battalion of the 5th Marine Regiment dashed from landing craft to the bomb-cratered shores of Wolmi, an island just offshore which had to be taken quickly since its guns commanded Inchon. In less than two hours Wolmi was captured. In the afternoon, after the tide had ebbed and come in again, Marine assault waves clambered over the city's sea wall, overcame sporadic enemy resistance and drove into the heart of Inchon. The plan to invade Inchon was carried out with brilliance by those who fought their way through the city. During the following days, the remainder of the 1st Marine Division disembarked and, together with four battalions of Korean marines, pressed toward Kimpo airfield, the Han River, and Seoul. The US 7th Division was put ashore and a portion of its troops moved south in the general direction of Suwon. The X Corps, having the advantage of complete air and naval supremacy, acted swiftly to capture the Seoul-Suwon area in order to dislocate the logistical supply of North Korean forces in South Korea. The Marine units had to fight for Kimpo, but they easily disposed of the Communist defenders who, making one fanatical rush, were decimated by American fire power. Within three days after the Inchon landing, UN planes were flying in and out of Kimpo airfield, the largest in Korea. On 18 September, the huge planes of FEAF Combat Cargo Command began an airlift to the field, augmenting the stream of supplies which the Navy was putting ashore at Inchon. The 187th Airborne RCT was flown into Kimpo to strengthen UN defenses in that sector. With Kimpo secured, ROK Marine and US Marine and Army units pushed inland to liberate Seoul. Caught between the X US Corps and the Eighth Army, and with dwindling sources of supply, the ultimate fate of the North Korean divisions in the south could be foreseen.

6. Chipyong-ni Defensive, 3-16 February 1951. Units: 23d Infantry Regiment of 2d US Infantry Division, French Battalion and Netherlands Detachment.

After the Inchon landing and breakout from the Pusan Perimeter, UN forces advanced steadily against a defeated North Korean army, captured the North Korean capital of Pyongyang and, at some points, thrust as far north as the Yalu River, Korea's northern boundary with Manchuria. On 25 November 1950 a new war began as Chinese Communist forces entered the war and pushed the overextended UN troops back as far south as a line belting the peninsula at Wonju.

Here UN resistance stiffened. At nightfall on 13 February 1951, the enemy attacked in strength at Chipyeong-ni, on the left hinge of the US X Corps' zone northwest of Wonju. This tiny village, no more than a few thatch-roofed huts clustered in a valley surrounded by snow-covered rocky peaks, happened to be the junction of several roads, and as such was a keystone of the central zone. If it fell the entire Eighth Army front might be endangered. The 23d Infantry of the US 2d Division and the French Battalion formed a defensive perimeter on a ring of low hills immediately around the town, and by mid-morning of the 14th, they were surrounded by a force later estimated to have comprised three Chinese Communist divisions. For three days the stalwart UN troops fiercely defended the Chipyeong-ni road junction against repeated attacks as enemy fire poured in on them from the surrounding mountains. UN air forces dropped food and ammunition to the beleaguered men and destroyed hundreds of enemy troops with strafing and napalm attacks. Even at night, aircraft were able to give a measure of support by using magnesium flares to illuminate the battlefield. American and French ground troops were fighting gallantly when an armored task force from US 5th Cavalry Regiment ran the gauntlet of enemy fire to join them. The following day when weary American and French soldiers climbed out of their foxholes they found that enemy pressure had melted away. For its extreme bravery in this action the French Battalion was awarded the American Distinguished Unit Citation as were the US 23d Infantry and attached troops. The defense of Chipyeong-ni proved to be the turning point in the enemy advance.

7. The CCF Second Spring Offensive, battle for Hangye, specifically Bunker Hill, 16-19 May 1951. Unit: 38th Infantry Regiment of the 2d US Division.

In March and April 1951, Operations KILLER and RIPPER advanced UN forces to a line approximating the 38th parallel. This set the stage for expected CCF Spring Offensives. During the second enemy offensive, on the night of 15-16 May 1951, an estimated 21 Chinese divisions, flanked by three North Korean divisions in the west and six in the east, struck down the center of the peninsula against the US X Corps and the ROK III Corps in the Naepyeong-ni - Nodong area. The X Corps held a 37-mile sector of NO NAME LINE from the high ground west of Hongchon northeastward to Inje. The US 1st Marine Division held the left part of the corps line on the jagged terrain overlooking Chunchon plain. To the right was the US 2d Division, with the ROK 5th and 7th Divisions on its right. Chinese units crossed the Pukhan River west of Chunchon, and on 16 May the two ROK divisions were heavily engaged along a 20-mile front in the vicinity of Hangye-ri, a village 10 miles northeast of Inje. The two divisions held their ground for a time, then fell back, disorganized and broken. On the left (west) shoulder of the enemy

salient, the US 2d Division, including the French Battalion and Dutch Detachment, withstood resolute enemy attacks until 18 May, and then, together with the 1st Marine Division, moved right to fill the gap left by the two ROK Divisions. The IX Corps extended its front to the right to cover the area left by the 2d Division and the marines. LTG Van Fleet raced the 15th RCT of the US 3d Division from Seoul to bolster the west face of the salient, and sent the 7th and 65th Infantry Regiments to blocking positions at the southernmost part of the penetration. The swarming columns of Chinese and North Koreans soon almost surrounded the 2d Division, pushing against its front, right, and rear. The Chinese even blocked the 2d's main supply route, but a coordinated attack by the US 9th Infantry driving northward, and the US 23d and 38th Infantry Regiments attacking southward along with their French and Dutch contingents, regained control of the route. The 2d Division stood fast and punished the enemy heavily. The 38th Field Artillery Battalion, firing in support, threw 12,000 105-mm rounds in 24 hours. LTG Edward M. Almond, commanding the X Corps, ordered the 2d Division back to a new line south of Hangye-ri on 18 May. The division, commanded by MG Clark L. Ruffner, successfully withdrew. During its defense it lost 900 men--killed, wounded, and missing--and estimated enemy casualties at 35,000.

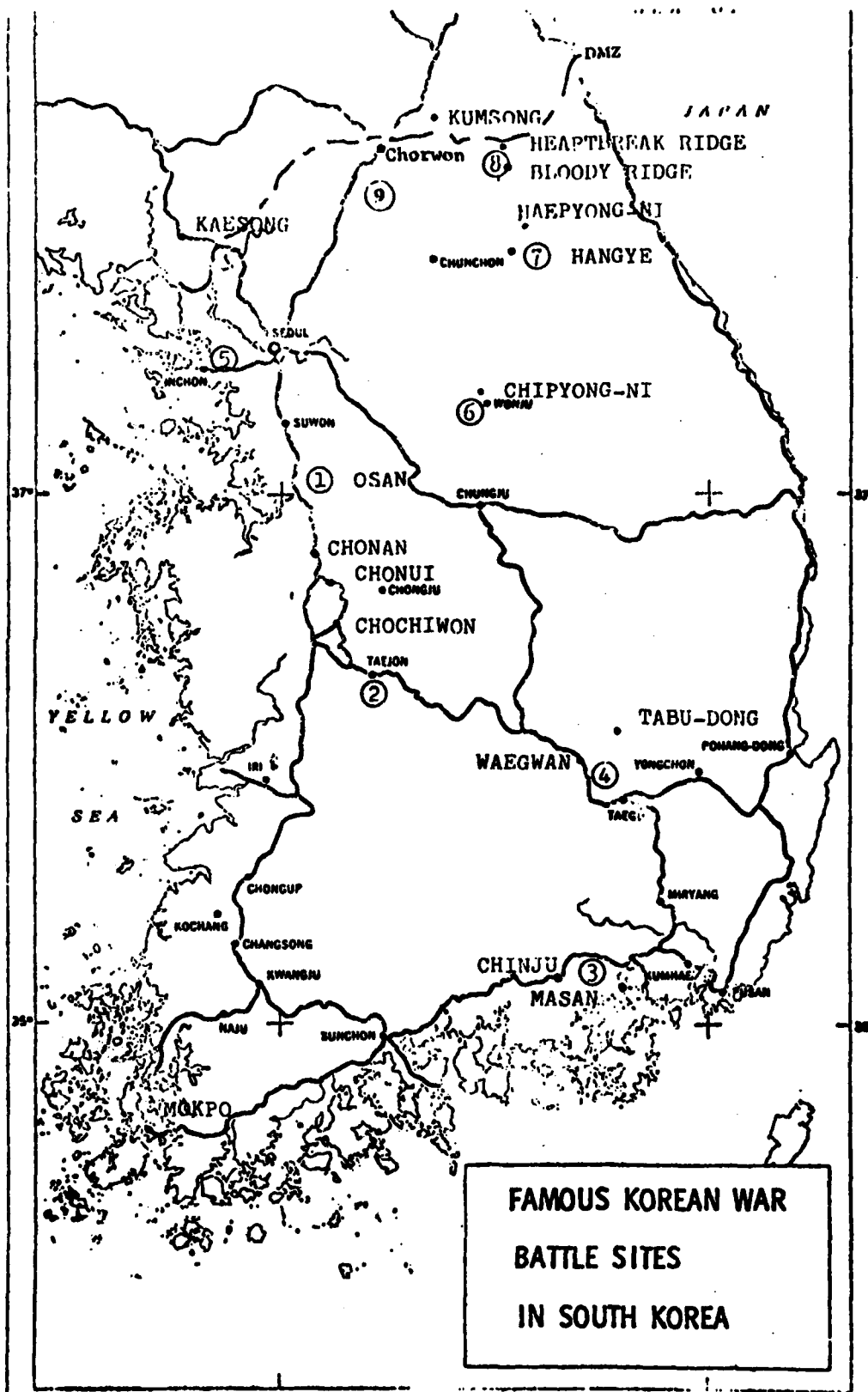
8. The Punchbowl Battles, specifically Bloody and Heartbreak Ridges, August-October 1951. Units: 2d US Infantry Division, ROK I Corps, 1st US Marine Division, and the French Battalion.

Late in August 1951, after the truce negotiations had been suspended, General James A. Van Fleet, Eighth Army commander, determined to resume the offensive in order to drive the enemy farther back from the Hwachon Reservoir (Seoul's source of water and electric power) and away from the Chorwon-Seoul railroad. Success in each of these enterprises would also straighten and shorten the UN front, give greater security to the KANSAS line, and inflict damage on the enemy. Therefore, the UN commanders decided to put forth a major effort in the X Corps zone, using all five divisions in that corps to continue the ridge-top and mountain actions in the Punchbowl area. The US 1st Marine Division, with ROK marine units attached, opened a drive against the northern portion of the Punchbowl on 31 August. Two days later the 2d Division attacked northward against Bloody and Heartbreak Ridges in the vicinity of the Punchbowl's western edge and Taeu-san. Both assaults, delivered uphill by burdened, straining infantrymen, met with initial success. By 3 September, the two divisions had reached their first objectives. Van Fleet ordered them to continue the advance as far north as the northwesterly leg of the Soyang River above the Punchbowl. On 11 September the 1st Marine Division attacked again. After seven days of heavy fighting, with the enemy resolutely defending each ridge top from mutually supporting positions and yielding only after repeated counterattacks and seesaw struggles, the marines secured their objectives on 18 September. Meanwhile, the 2d Division, on Bloody and Heartbreak

Ridges west of the Punchbowl, was engaged in the fiercest action since spring. Like the marines, the 2d Division infantrymen, often carrying 60-mm mortar or 75-mm recoilless rifle rounds as well as their own ammunition and equipment, crawled hand over hand up towering, knife-crested ridges to assault the hard-fighting enemy who would yield a ridge only in desperation, then strike back in vigorous counterattack. The same crest often changed hands several times each day. By 19 September the X Corps front was stabilized except in the 2d Division's zone. Supplied by airdrop and by sturdy Korean carriers with A-frames strapped to their backs, and heavily supported by aircraft and artillery, the 2d Division fought on bitterly. In one instance it delivered, within the space of twenty-four hours, no less than eleven separate assaults, all unsuccessful, against one ridge. The battle raged into October. Finally, on the 14th, after the enemy seemed to be willing to reopen the truce talks, the last ridge was secured and the 2d Division consolidated its hard-won gains.

9. Operation Counter, Chorwon Sector, 6-29 June 1952. Unit: 45th US Infantry Division.

As the year 1951 drew to a close the character of the conflict returned to that of July and early August. Fighting tapered off into a monotonous routine of patrol clashes, raids, and bitter small-unit struggles for key outpost positions. By the end of the year a lull had settled over the battlefield with the opposing sides deployed along defense lines that spanned the breadth of the peninsula. However, during May and June of 1952 the enemy became bolder, making raids against the 45th US Infantry Division in the Chorwon Sector. As a result of increased Chinese ground activity at the hinge of the Eighth Army's line west of Chorwon, MG David L. Ruffner, the 45th Division commander, planned an operation to establish eleven patrol bases across his division's front. If his plan succeeded these bases would screen the division's main line of resistance more adequately by denying the enemy their use. This operation, known as Operation COUNTER, began on 6 June when the two front-line regiments of the division launched a series of attacks to occupy the eleven objectives. By 7 June all but one objective had fallen to the assault units of the division. The enemy followed up with a series of counterblows during the next five days, but these were successfully repulsed. Seven days later, 13 June, the 45th Division opened Phase II of COUNTER to seize the last objective, a hill which the 45th had abandoned in March. It lay at the southern tip of a T-shaped ridge line eight miles west and slightly north of Chorwon. The struggle for the height began with an air strike and a preparatory artillery bombardment. The 2d Battalion of the 180th Infantry then crossed the line of departure and engaged the Chinese at close quarters. American infantry repulsed four company-size Chinese counterattacks. Next day the regiment's 3d Battalion relieved the 2d and secured the objective. UN aircraft flew fifty-eight close-support missions during the first eighteen hours, and UN guns fired 43,600 rounds during the forty-eight-hour battle. At noon on 14 June, Phase II of Plan COUNTER ended with the new chain of patrol bases one half to two miles in front of the main line of resistance secure in the division's hands. The Chinese immediately launched counterattacks along the entire front of the 45th Division. They first expended about two battalions in futile efforts to retake Hill 191. Then, on the night of 20-21 June, they opened a regimental assault, supported by 5,000 rounds of artillery and mortar fire, against Hill 255, southwest of Hill 191.

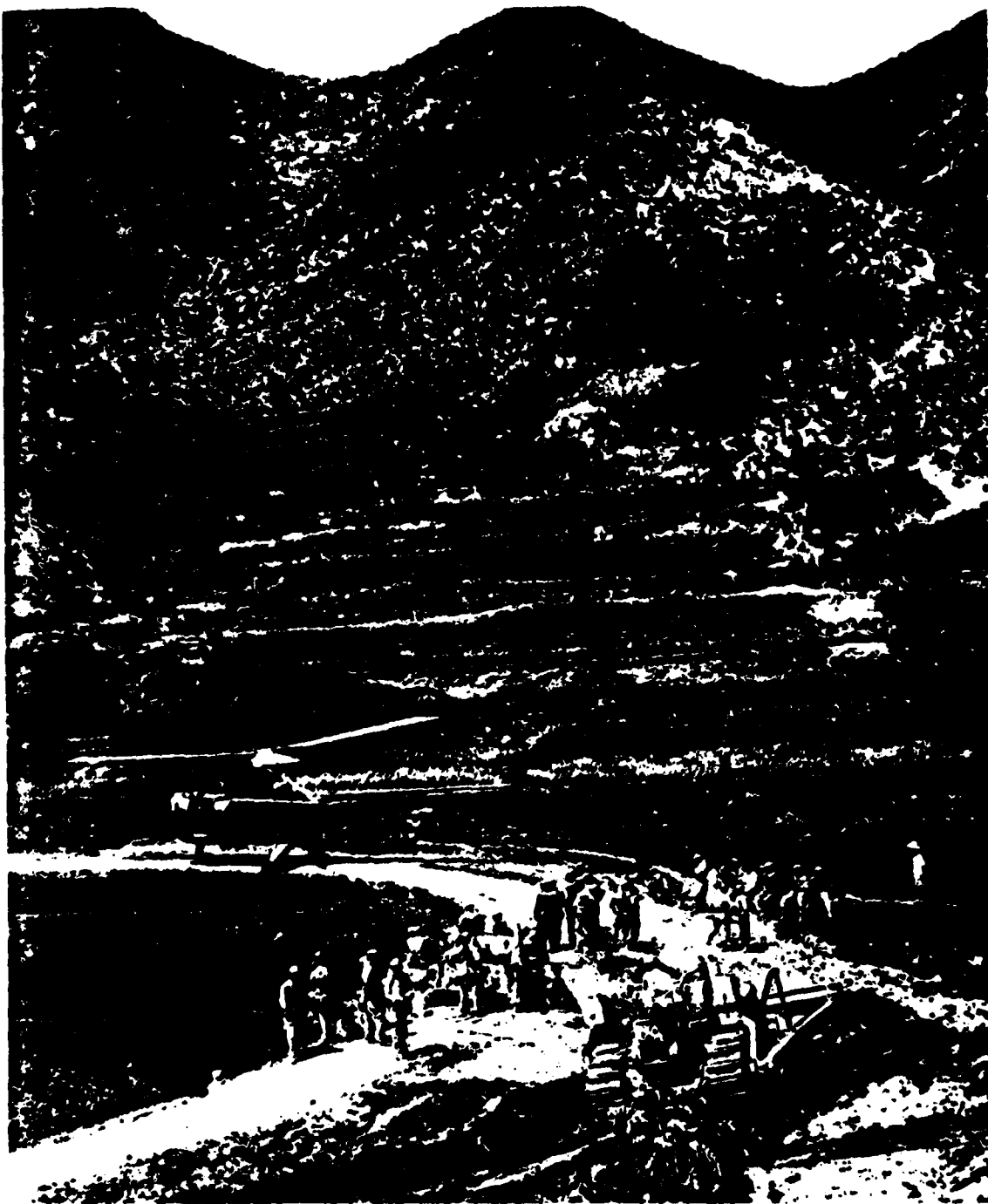




ACTIVITY NEAR THE FRONT, 7 July. American soldier checks the fuse on a land mine, planted near Ch'onan (top left) ; ROK soldier unaccustomed to American shoes carries them on the march (top right) ; South Korean civilians, fleeing from the North Koreans, pass a ¼-ton 4x4 truck (jeep) which is equipped for laying communications wire.



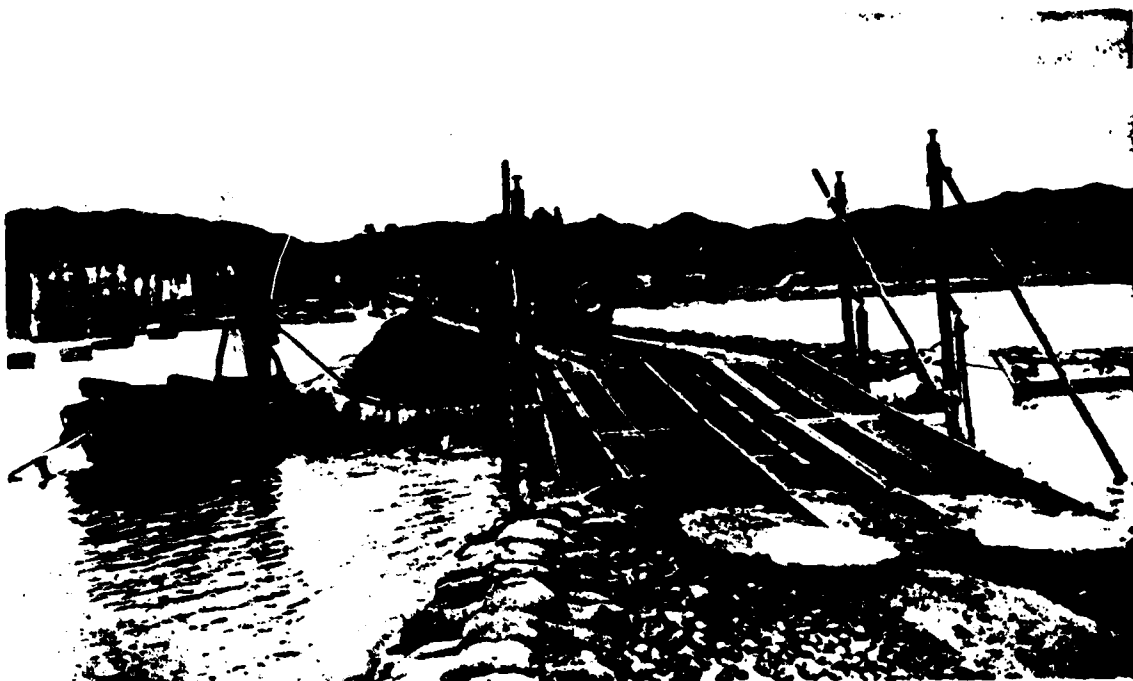
DESTRUCTION OF A KUM RIVER BRIDGE. Demolitions set off on the bridge by Americans (top) resulted in the wide gap (bottom). On 12-13 July U.N. forces made a planned withdrawal to the south bank of the Kum, leaving rear guard troops behind to delay the enemy's drive in the direction of Taejon and Taegu.



AN ATTEMPT TO RETRIEVE A MEDIUM TANK which is embedded in a hole in a road. Helicopter in the background is preparing to take off. By 10 August the North Koreans had reinforced their bridgehead southwest of Ch'angnyong despite a counterattack by Americans; in the Waegwan area enemy bridgeheads were destroyed, while on the east coast the North Koreans threatened P'ohang-dong.



INFANTRYMEN SCOUT ALONG A HIGHWAY as Sherman medium tanks M4 wait around the bend, 14 August. On 13-14 August the U.N. army was greatly outnumbered by the enemy who faced them across the Nakdong River. Planes were evacuated from Pohang-dong airstrip because of constant enemy artillery fire.



TREADWAY BRIDGE across the Naktong River constructed by U.S. engineers. Before the bridge was built, the only means of crossing the river was a small ferry operated by South Koreans (top). Artillery moving up over muddy ground into firing position near Taegu. Several tanks and men can be seen in the background (bottom).



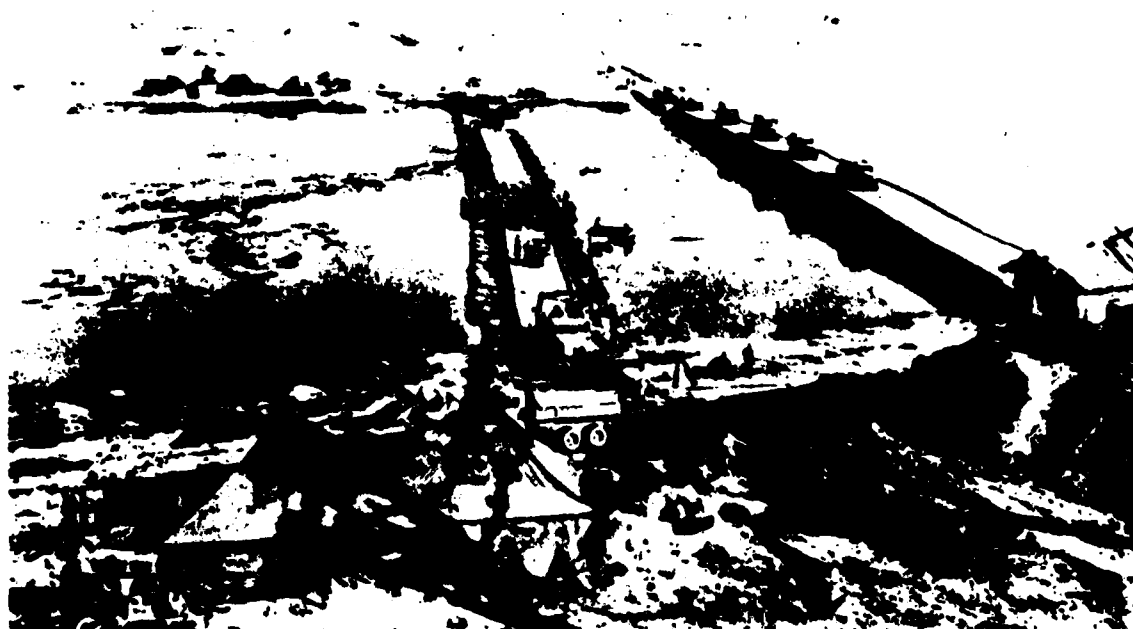
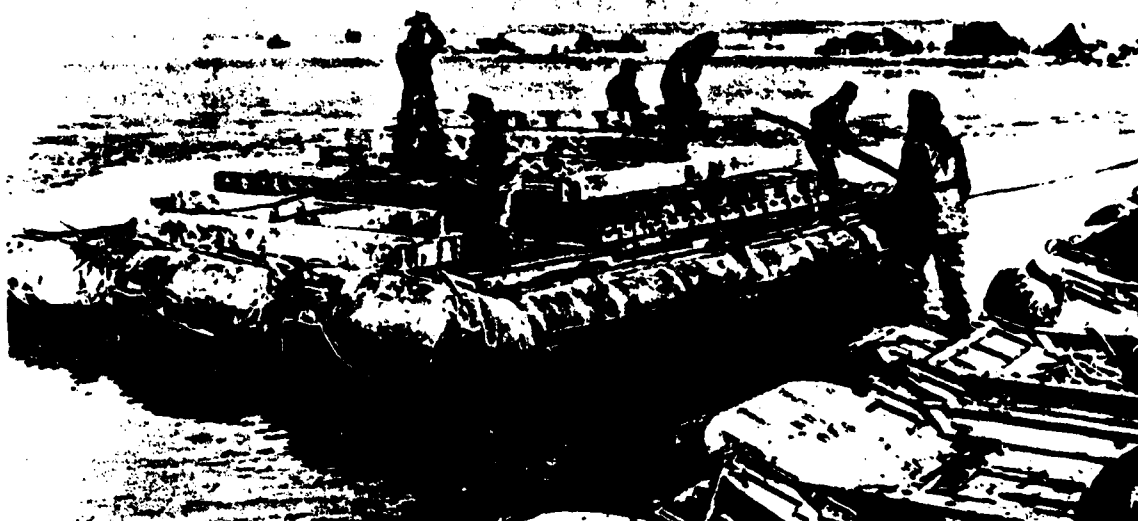
U.S. SOLDIERS SEARCHING FOR MINES along a riverbank near Chinju.
The mine detector is an SCR 625.



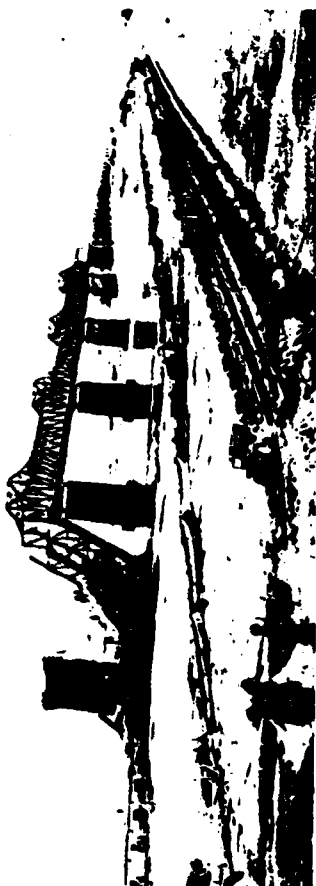
ENGINEERS WORKING ON AN IMPROVISED BRIDGE next to one which was knocked out in the Chinju area (top); a Bailey bridge being constructed over one destroyed near the Naktong River (bottom). Note damaged T34 tank beneath a knocked-out span of the former bridge. During the advances of the U.N. army many bridges, destroyed while the units were pulling back into the Pusan beachhead, had to be repaired or reconstructed to permit the rapid movement of men and supplies.



A DESTROYED BRIDGE ON THE OUTSKIRTS OF YONGJU in use after being repaired with sand bags (top); vehicles leaving a ponton bridge across the Han River near Seoul (bottom). U.N. forces continued to clean out stubborn pockets of resistance in the Seoul-Suwon-Osan region, while to the south advances were made toward Taejon. Other U.N. forces reached Anui and Samga, and the units driving toward the 38th parallel captured Ulchin, Yech'on, and Ch'unyang.



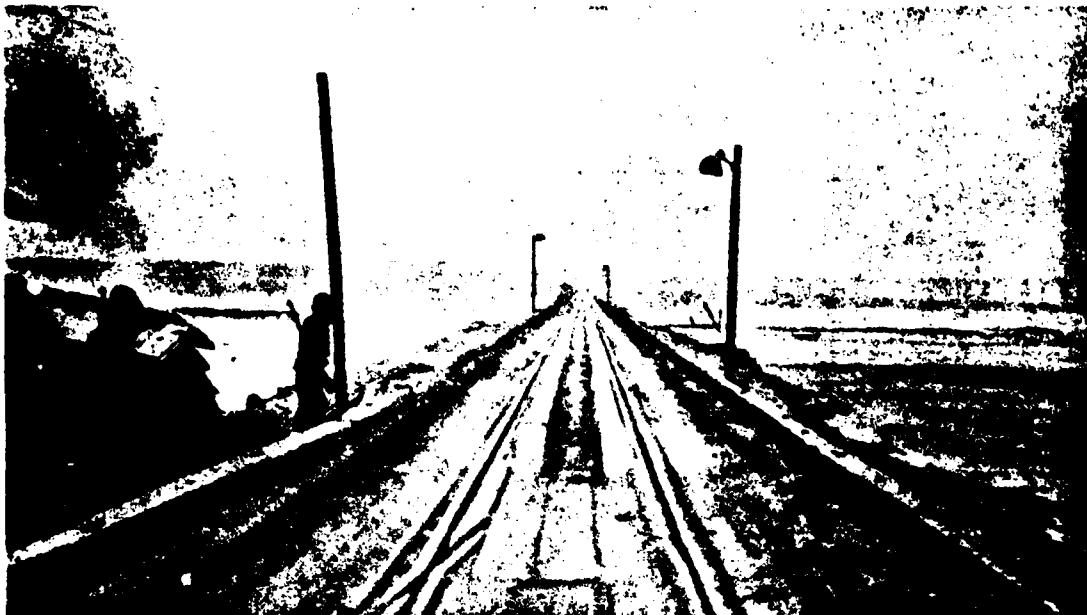
ENGINEERS FLOATING A SECTION OF TREADWAY BRIDGE into place over the Taedong River (top); engineers working on a treadway bridge as vehicles cross the Taedong River over another bridge (bottom). These bridges were destroyed after the last of the U.N. forces had moved out of the area.



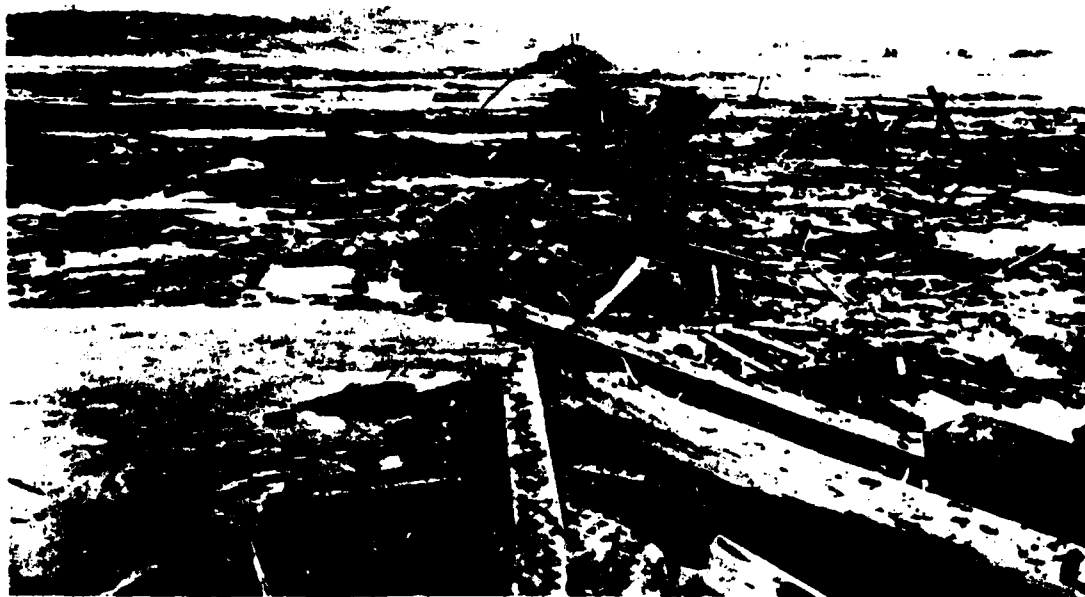
Crusader tanks entering Seoul as they are pulled back from the 38th parallel (bottom).
By the end of 1950, the Eighth Army was forming new lines along the 38th parallel.



KOREAN CIVILIANS CROSSING THE HAN RIVER, again moving away from their homes (top left); military traffic crossing the Han River (top right); British



RAIL BRIDGE ACROSS THE HAN RIVER is demolished by engineer troops. Both photographs were taken on 4 January.





PONTON BRIDGE SPANNING THE ICY HAN is blown up after last of the U.N. forces evacuate Seoul, 4 January.





2D DIVISION VEHICLES IN MOUNTAIN PASS south of Wonju, 10 January. In this sector enemy troops flooded through the gap to the right of 2d Division positions and ROK III Corps lines.



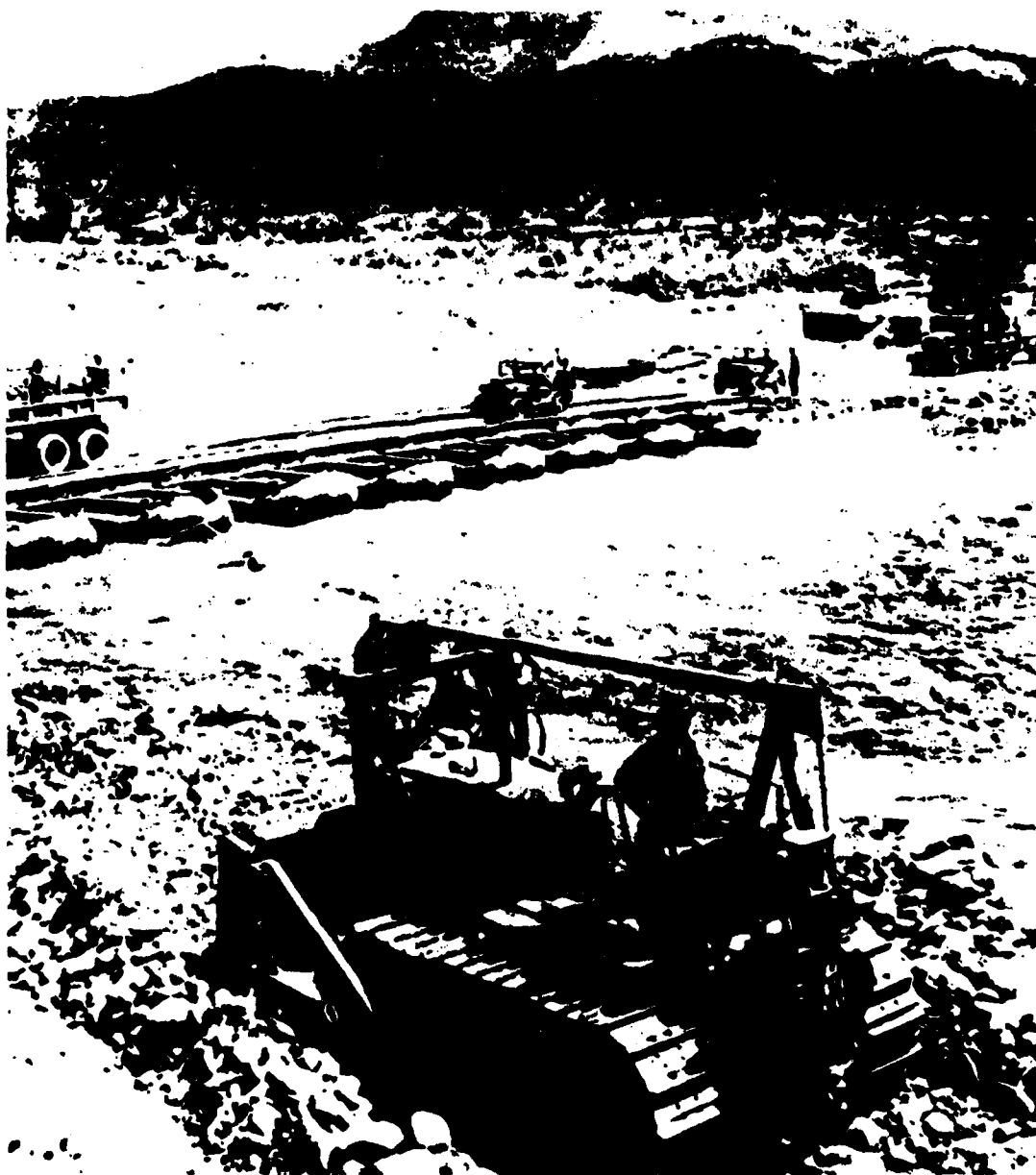
SUPPLY CONVOY HELD UP by accident on icy highway. Temperatures reached 25 degrees below zero during the fighting for Wonju, attacked by Communist forces 7 January.



MEN OF THE 17TH INFANTRY TAKING COVER BEHIND A STONE WALL, 20 February. On 18 February the 17th Regimental Combat Team, 7th Division, attacked northwest from Chech'on in the central sector.



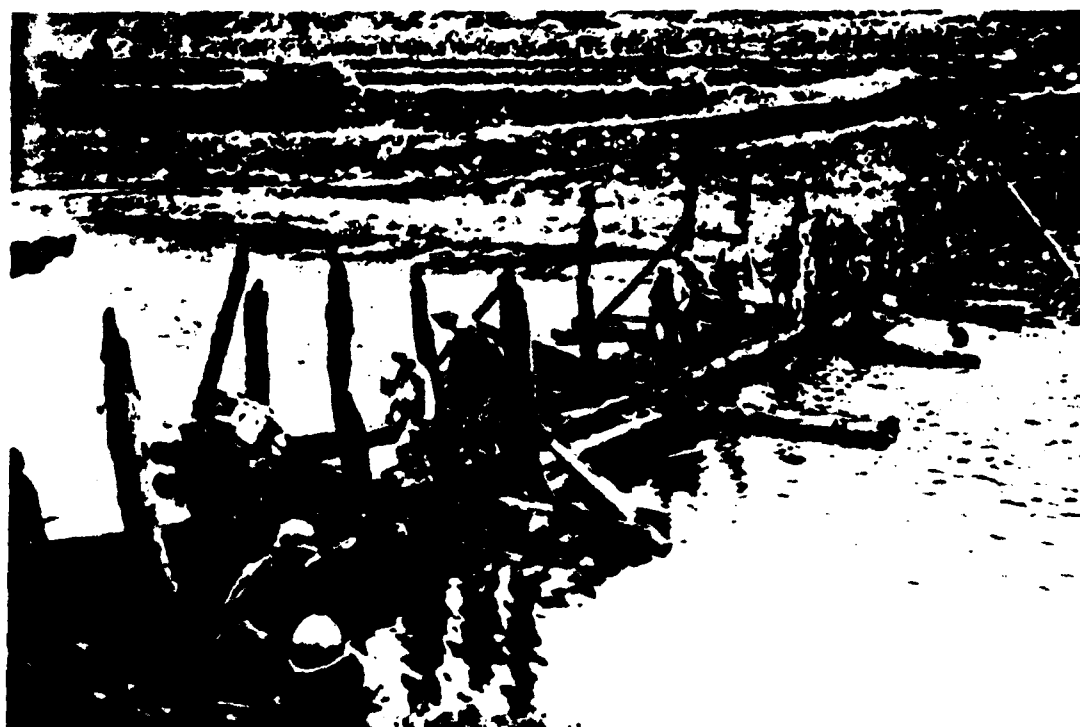
7TH DIVISION TROOPS TRUDGING UP HILL 675 after crossing the snow-covered valley (background). On 20 February Chuch'on-ni was secured.



CONVOY CROSSING THE SOYANG RIVER. By 8 April the 7th Division put two battalions across the Soyang River, and by 19 April U.N. forces were in position along Line UTAH.



M4 TANKS OF 1ST CAVALRY DIVISION fording the Imjin River.



ENEMY-MADE FOOTBRIDGE used by 7th Infantry, 3d Division, in withdrawing from the front lines.



MEN OF THE 23D INFANTRY trying to save equipment in the swollen Soyang River.



PONTON BRIDGE IN 3D DIVISION SECTOR washed several hundred yards downstream by flash floods. During August heavy torrential rains bogged down lines of communication to the front.

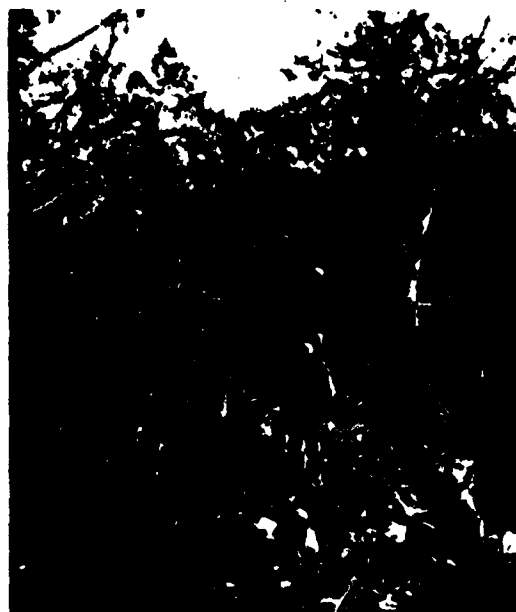


FIRE DIRECTION AND CONTROL TEAM of the 23d Infantry within view of Hill 931, crest of Heart-break Ridge, in background.

YAGU-SAN
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COMPANY E, 23D INFANTRY, ON ITS WAY TO HILL 931 to relieve Company C, which had been fighting on the ridge for nine days. One of the men rests near an enemy casualty, below.



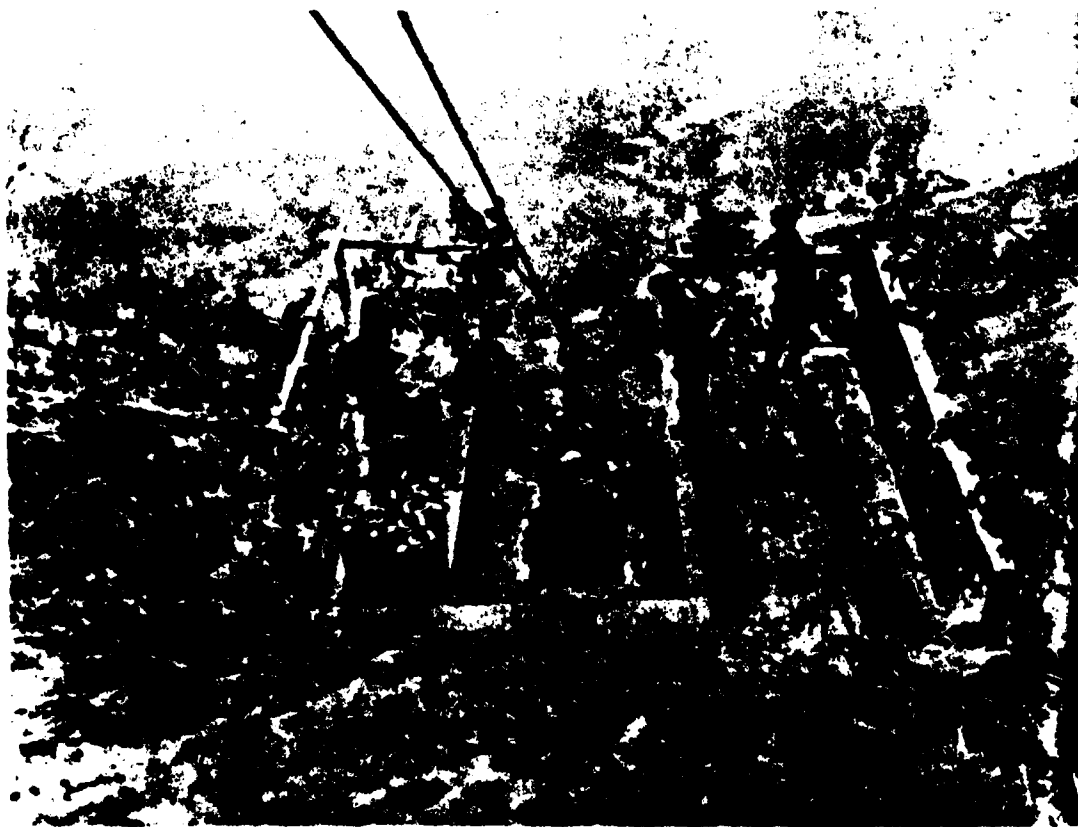


378TH ENGINEER COMBAT BATTALION constructing a treadway bridge across the Pukhan River, ROK 6th Division sector of IX Corps area, November 1951.





CABLE CAR, built by 3d Engineer Construction Battalion. Starting point is at foot of Hill 770, left; the car nears the platform at the top of the hill, below. Engine from a discarded $\frac{1}{4}$ -ton truck supplied power for the car, which traversed a distance of 1,530 feet from bottom to top. At several stages of its journey the car dangled as much as 200 feet off the ground.





7TH DIVISION POSITION just before it was abandoned, 31 July.



40TH DIVISION TROOPS all packed and ready to leave Heartbreak Ridge.



1ST MARINE DIVISION MEN after receiving word of the armistice.

APPENDIX III
DEMOLITION INSTRUCTIONS

DEMOLITION INSTRUCTIONS - KOREAN WAR

1. The execution of demolitions and necessary military destruction shall be such as to combine maximum destruction to the enemy with minimum harm to the civilian population. Destruction for destruction's sake will not be permitted, nor will anything approaching "Scorched Earth" tactics be condoned.

2. Among legitimate and necessary targets for demolition are routes of communication; telegraph, telephone and radio installations; dock facilities, and military supplies of all kinds, including food. Utility installations, such as power plants and water supply systems which primarily serve civilian centers, will not be destroyed, nor will buildings be burned merely because at some future date they may be used to house enemy headquarters.

3. Divisions and Independent Brigades, Regimental Combat Teams, and Task Forces are responsible for tactical demolitions within their respective areas unless specifically directed otherwise.

4. Supply services are responsible for demolition of any supplies or equipment that they can not evacuate. Services will execute their own demolitions to the maximum extent of their capabilities. The Corps Engineer will be notified, as early as can be anticipated, of any demolitions for which the assistance of Engineers is required.

5. Corps Engineer units will normally execute special demolitions. Corps orders will be issued specifying responsibility for special demolitions.

6. The destruction of highway bridges and roads will be governed by local tactical situations and will in any event be limited to the minimum essential for the purpose intended.

7. The entire sector will be covered with particular attention to main routes and to exposed flanks.

8. Effort will be concentrated on the most effective bridges and defiles.

9. Demolitions will be conducted so as to avoid injury to civilians and damage to private property.

10. Adequate guards will be placed on charged bridges to prevent premature demolitions. No bridge once prepared for demolition will be left unguarded, even though charges have been removed, without approval of the Corps Engineer, so that arrangements can be made to have guard responsibility transferred to another unit.

11. Charges will be placed as late as possible consistent with placing the demolitions in an orderly and unhurried manner. Charges ordinarily will be primed after the structure no longer is required by our forces. However, if the structure is needed by our forces until immediately before the demolition, priming of charges will commence at a time calculated to enable completion immediately prior to execution of the demolition.

12. When operating out of contact with the enemy, guards will be placed on the enemy, as well as the friendly, side of all demolition projects to keep civilians a safe distance away. When necessary for guards to cross back over streams to accomplish this, assault boats will be arranged for.

13. Pile and trestle bent bridges will have at least 150 feet of bridge destroyed at the elevation of the river bottom. The remainder of the pile or trestle bents will be destroyed at the lowest possible water level. If time permits, all pile and trestle bents will be demolished to the level of the river bed.

14. No explosive material will be abandoned or left unguarded in any location.

15. Foodstuffs in the hands of individuals will not be destroyed. However, large quantities of foods such as are normally found in warehouses will be evacuated to the greatest extent possible and any remaining foods will be destroyed only if necessary to prevent them from falling into the hands of the enemy. The Civil Assistance Corps is in charge of evacuating foods. Engineer units will be informed by the Corps Engineer of any quantities that they may be expected to destroy.

16. Nothing in the foregoing is intended to restrict Major Commanders in taking or directing such action with respect to demolitions as is necessary for the safety of their troops or the accomplishment of their mission.

APPENDIX IV

THE FLYING BRIDGE

"THE FLYING BRIDGE"

1968

by

CPT James A. Veleziz, CE

I. INTRODUCTION

The Vietnam War has precipitated many new and challenging demands on the Corps of Engineers. One demanding challenge is that of providing instant reaction and quick emplacement of tactical bridging in support of the everchanging tactical situation. With the fast moving tactics presently employed there, the tactical units cannot afford the time for conventional employment methods.

This article is intended to convey recent information on new methods and developments, that have made it possible for the Engineer, to provide the immediate and dependable crossing capability now required. This information was compiled from the author's personal experience while serving as Bridge Company Commander with Company E, 65th Engineer Battalion (25th Infantry Division).

The introduction of the Chinook (CH-47) and the Scycrane (CH-54) helicopters has brought about some revolutionary developments to the battlefield of Vietnam. Their tremendous airlift capability makes them very adaptable in transporting engineer equipment, especially float bridge equipment. For example, during an eight month period (June 1967 to February 1968), the bridge company airlifted over five hundred (500) loads of tactical bridging in support of combat operations.

The loads were of various types, configurations, and weights. They included all components of the M4-T6, Light Tactical Raft (LTR), the Class 30 Assault Trackway, and the Bridge Erection Boat. Dry Spans, rafts, and float bridges were the most used configurations.

During the Monsoon Season, the Dry Span (38'4" and 45') became in-

dispensable as roads failed or washed out. They were used to bridge gaps, corduroy soft and muddy sections of tactical roads, and repair washed out sections of the Main Supply Routes (MSR). This proved to be valuable in areas where construction equipment and materials were not readily available, or the tactical situation was such that, time was of the essence. By having the bridges preassembled and airlifted from rear areas, it was possible to achieve instantaneous reaction time and immediate deployment. As a matter of fact, reaction time was reduced to simply the time required to obtain the aircraft.

For example, during an Operation into the notorious Hobe-Boloi Woods, several roads failed, in large sections, due to heavy rains. These roads were upgraded to Class 60 within a day and a half by the use of dry spans and assault trackway. A total of twenty four 33'4" dry spans and 450' of assault trackway were used in the operation. As a result, the tactical commander was able to move his maneuver elements quickly into position. This would have been almost impossible had conventional methods been used to upgrade the roads, ^{since} ~~as~~ road construction is a very slow process during the Monsoon Season.

II. PLANNING FOR AIRLIFT OPERATIONS

The success of any airlift operation depends considerably on the degree of planning and coordination affected prior to the actual air delivery mission. This becomes particularly important when time and aircraft availability are critical. Therefore, it becomes imperative for the ground unit to always have a loading plan, regardless of how abbreviated or detailed it has to be because of operational commitments. Following are some important considerations that should be applied to any bridge air delivery mission.

1. Determine the Bridge Equipment Requirement: After deciding the

the length and type of bridge or raft to be used, it is necessary to determine the exact amount of each component and carefully determine the configuration of each load. Each load must be kept in the best useable configuration as possible. (See attached annexes).

2. Load Plans: Load plans, when properly prepared, serve a dual purpose. First, they serve as a check to the unit commander in assuring him that all the required equipment has been prepared. And secondly, they list the number of loads, type and weight of loads, and approximate time schedule required for each mission.

3. Positioning of Loads: Carefull consideration should also be given to the positioning of the loads prior to airlift. The assembly area should be located on a relatively flat and cleared area. A grassy or hard-top cover is preferable as it reduces the dust problem created by the tremendous helicopter downwash during takeoff and landing. The loads should be positioned in a neat and orderly manner. This is very helpful to the hook-up man and the individual responsible for the airlift.

4. Rigging of Loads: All effort and planning will be wasted if little or no consideration is given to the proper rigging of loads. The rigging of loads is probably one of the most important steps in any airlift operation and should receive prime consideration. When a load is lost because of faulty rigging, it is not only difficult to replace the equipment, but more important, it causes a delay in the accomplishment of the mission. In combat situations, the loss of time can become very critical and can endanger the tactical situation. All rigging equipment should be constantly checked for serviceability. A competent individual should always check all rigging equipment. Rigging methods that have been developed and field tested are described in enclosed annexes.

5. Final Inspection: A final inspection of all preparations should be made by responsible supervisory personnel in sufficient time prior to airlift, in order to affect any changes or additional work required. The inspection should be very thorough and should include the proper number of pieces for each load, that each load is bundled and secured properly, that rigging is properly placed, that taglines are provided where required, and that the load plan conforms to what is on the loading zone. The police of the area should also be checked at this time.

6. Priority of Loads: The priority in which the loads are airlifted should be carefully determined. Considerable time and effort can be realized if loads are delivered to the construction site in the priority and sequence required by the construction crew. It is very important that this be done, especially where the construction site is limited or restricted. Other limiting factors to the priority are the number of loads required for the mission, the number of aircraft supporting the mission, and the flight distance from the rear assembly site to the actual construction site.

7. Coordination: Last, but not least, close and constant coordination between supported and supporting units is very beneficial and should be encouraged. Coordination with aircraft personnel is particularly important as it can eliminate a lot of the difficulties encountered during airlift operations. A short briefing covering the overall mission, type of loads, and some load characteristics will be very helpful to them.

III. SAFETY CONSIDERATIONS

The following safety precautions should be constantly emphasized during all air delivery operations involving bridge equipment:

1. Ground crews should be in constant radio contact with helicopter crews to assure immediate reaction to any emergency that might arise.
2. Radio whip antennas should be removed or tied down while operating near helicopters.
3. No smoking within 50 feet of a stationary helicopter, or during take-off and landing.
4. It is recommended that earplugs be worn by troops working near helicopters for extended periods for noise protection.
5. Due to the high velocity rotor wash of the helicopters, exposed personnel, tents, loose equipment or trucks with canvas should be at least sixty meters away from the helicopter landing area. This also helps to eliminate the possibility of articles being swept up into the engines.
6. All hook-up men should wear protective goggles and ear plugs.
7. Before hooking up the load, the hook-up man should use a grounding rod, if available, to discharge any static electricity that is present by touching the cargo hook.
8. The hook-up man should hold the doughnut as high as possible and should not attempt to "chase" the cargo hook.
9. After hook-up, the hook-up man should clear the load and from under the helicopter as soon as possible.
10. A minimum of 2 men should be placed on each tagline when emplacing any dry span or trestle by helicopter.
11. Taglines should be adequately weighed down to prevent tangling with rotors. (Attach one saddle beam pin to each tagline or equivalent weight)

IV. RIGGING EQUIPMENT

The unit airlifted most of the loads with the Aeroquip multiple chain leg slings. This sling is very adaptable for rigging float bridge equipment. Its chain legs provide quick access into hard-to-get-to lifting points. The chain legs also eliminate the need for padding, required to reduce metal to nylon contact, on most of the loads. The sling is adjustable, requires no additional rigging material, easy to handle, and reduces the rigging time to several minutes for all loads.

The Air Delivery (AD) slings can also be used for rigging this equipment. However, many rigging configurations become bulky, intricate, and cumbersome for the user. They require considerable stockage of many components, excessive padding, and considerable time for rigging.

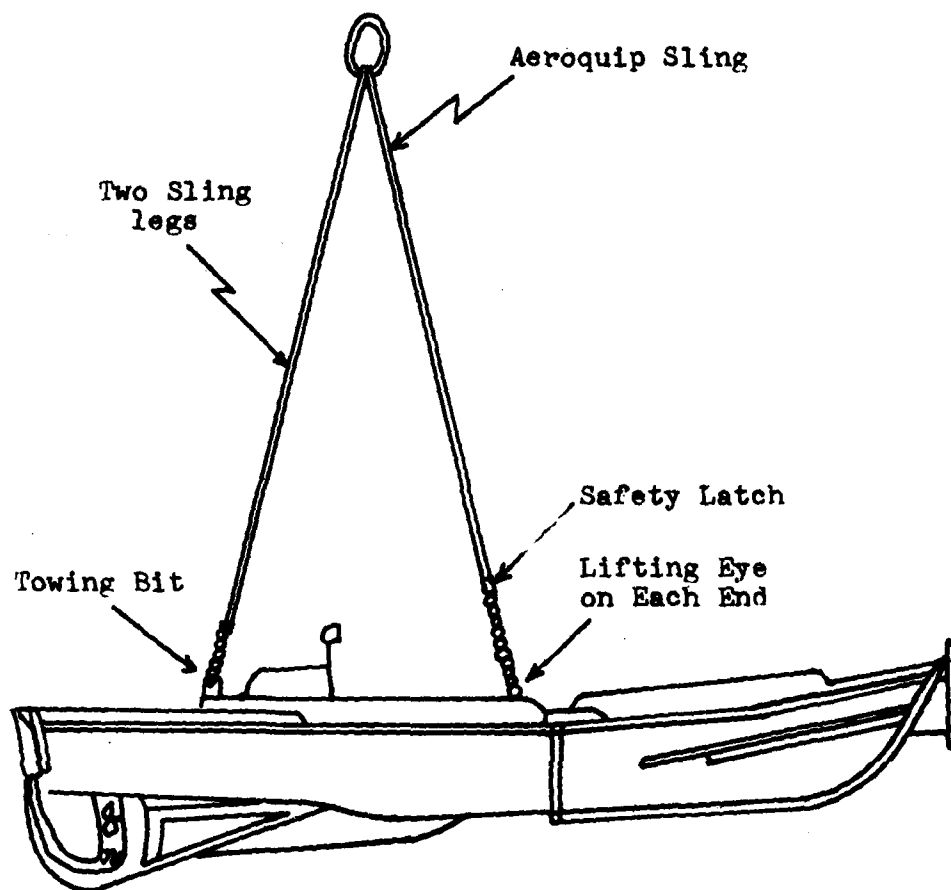
For reasons mentioned above, it is recommended that the Aeroquip sling be used whenever available.

Rigging equipment used in the Vietnamese environment requires constant care and close inspection before each use. When not in use, it should be stored in a covered shed with sufficient ventilation. They should be draped and allowed to dry before next use. They should also be inspected for frayed, torn, or cut sections. If at all possible, slings should not be left under direct sunlight for prolonged periods because nylon deteriorates very rapidly.

V. TYPICAL LOADS

The following are examples of typical loads used in the construction of bridges and rafts of various sizes:

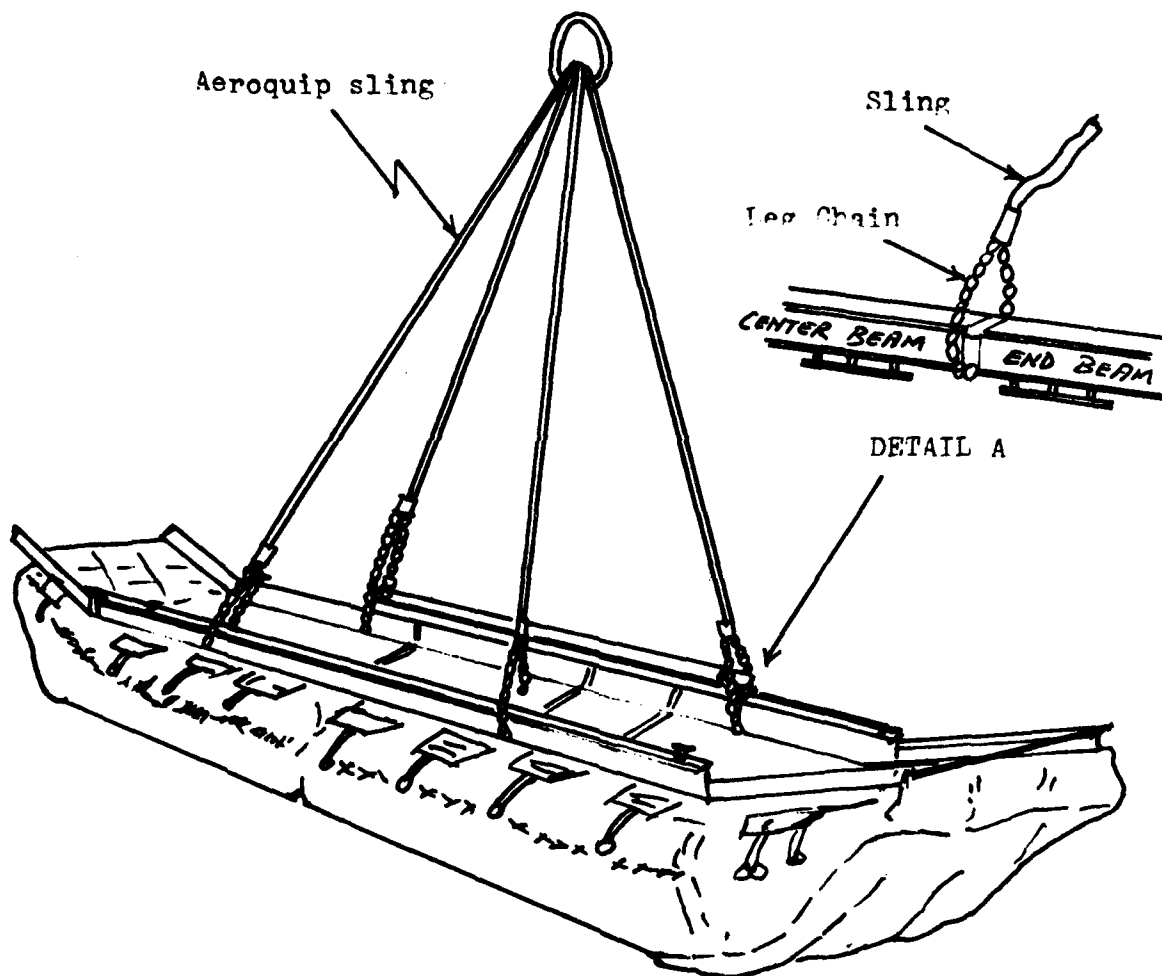
<u>DESCRIPTION OF LOAD</u>	<u>WEIGHT IN LBS</u>	<u>AIRCRAFT USED</u>	<u>REFERENCE</u>
27' Bridge Erection Boat	6,800	CH-47	Annex A
M4T6 Float Assembly	7,200	CH-47	Annex B
H-Frame, 38'4" Dry Span	8,516	CH-47	Annex C
Balk Load, 38'4" Dry Span	8,000	CH-47	Annex D
Complete 38'4" Dry Span	15,864	CH-54	Annex E
H-Frame, 45' Dry Span	7,805	CH-47	Annex F
Balk Load #1, 45' Dry Span	7,875	CH-47	Annex G
Balk Load #2, 45' Dry Span	6,664	CH-47	Annex H
Complete 23'4" Dry Span	10,354	CH-54	Annex E
Complete 30' Dry Span	12,867	CH-54	Annex E
Trestle, 50 ton, Single	4,122	CH-47	Annex
Trestle Set, 50 ton w/22 pcs Short Balk	10,456	CH-54	Annex I
Trestle Set, 50 ton w/22 pcs Normal Balk	12,722	CH-54	Annex I
LTR Pontons (8 Half Pontons)	5,800	CH-47	Annex J
LTR Superstructure, Half Load	5,825	CH-47	Annex K
Assault Trackway (150' Roll)	8,000	CH-47	Annex
Balk Load, 21'8" Raft Overhang	5,826	CH-47	Annex L
2-M4T6 Floats Connected w/4 Normal Balk	15,300	CH-54	Annex M



27' BRIDGE ERECTION BOAT (6,800 Lbs.)

1. Pass one chain leg through each lifting eye located forward on the stern section - passing 14 chainlinks through the safety latch.
2. Wrap the two chain legs around the towing bit twice and pass 4 chain links through the safety latch.
3. Secure all hatches.
4. Inspect for proper rigging.
5. Boat is now ready for airlift.

ANNEX A

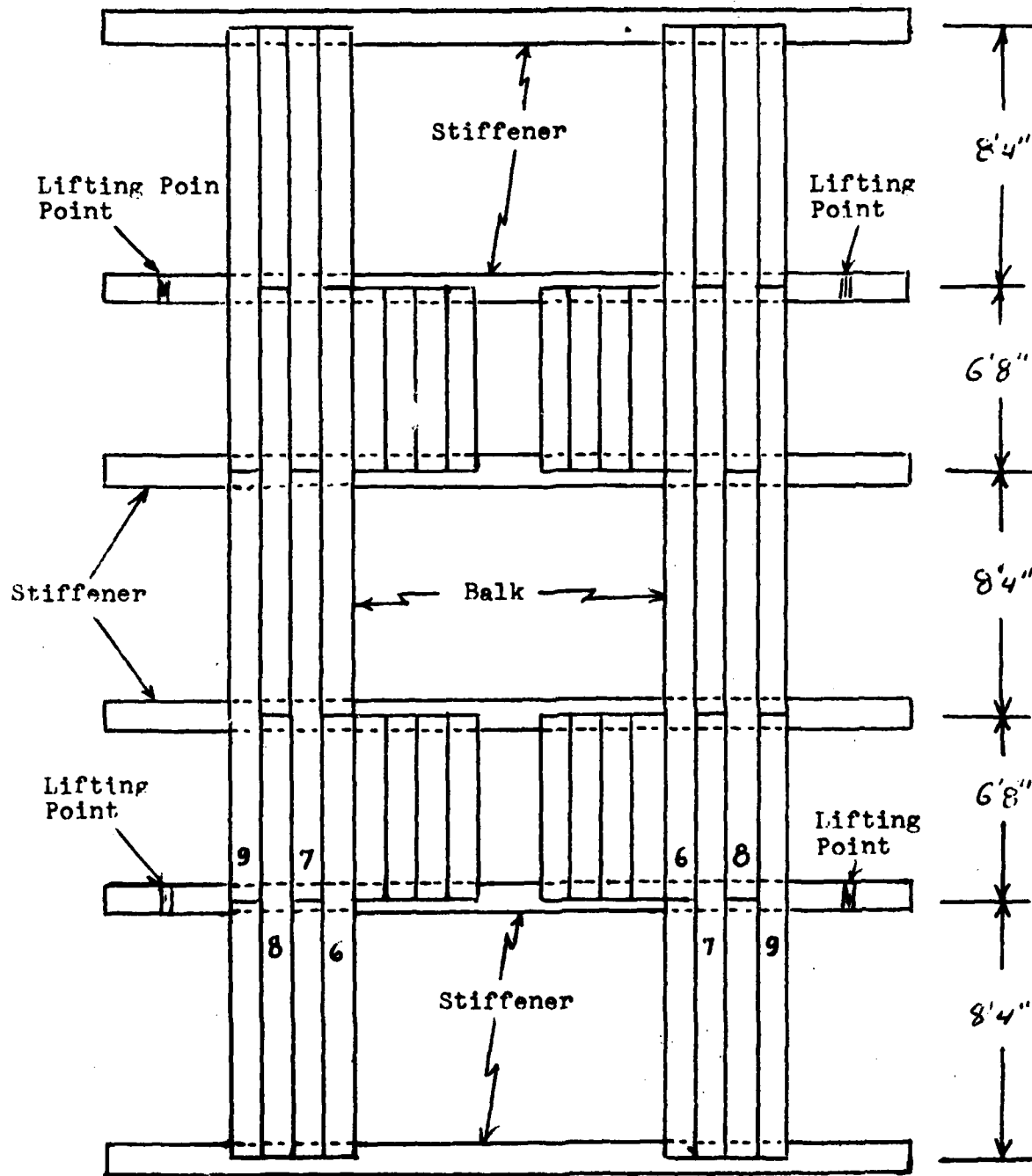


24-TON FLOAT & SADDLE ASSEMBLY (7,200 Lbs.)

1. Float is rigged as shown.
2. Secure any additional equipment placed on the saddle assembly.
3. Inspect for proper rigging.
4. Float is ready for airlift.

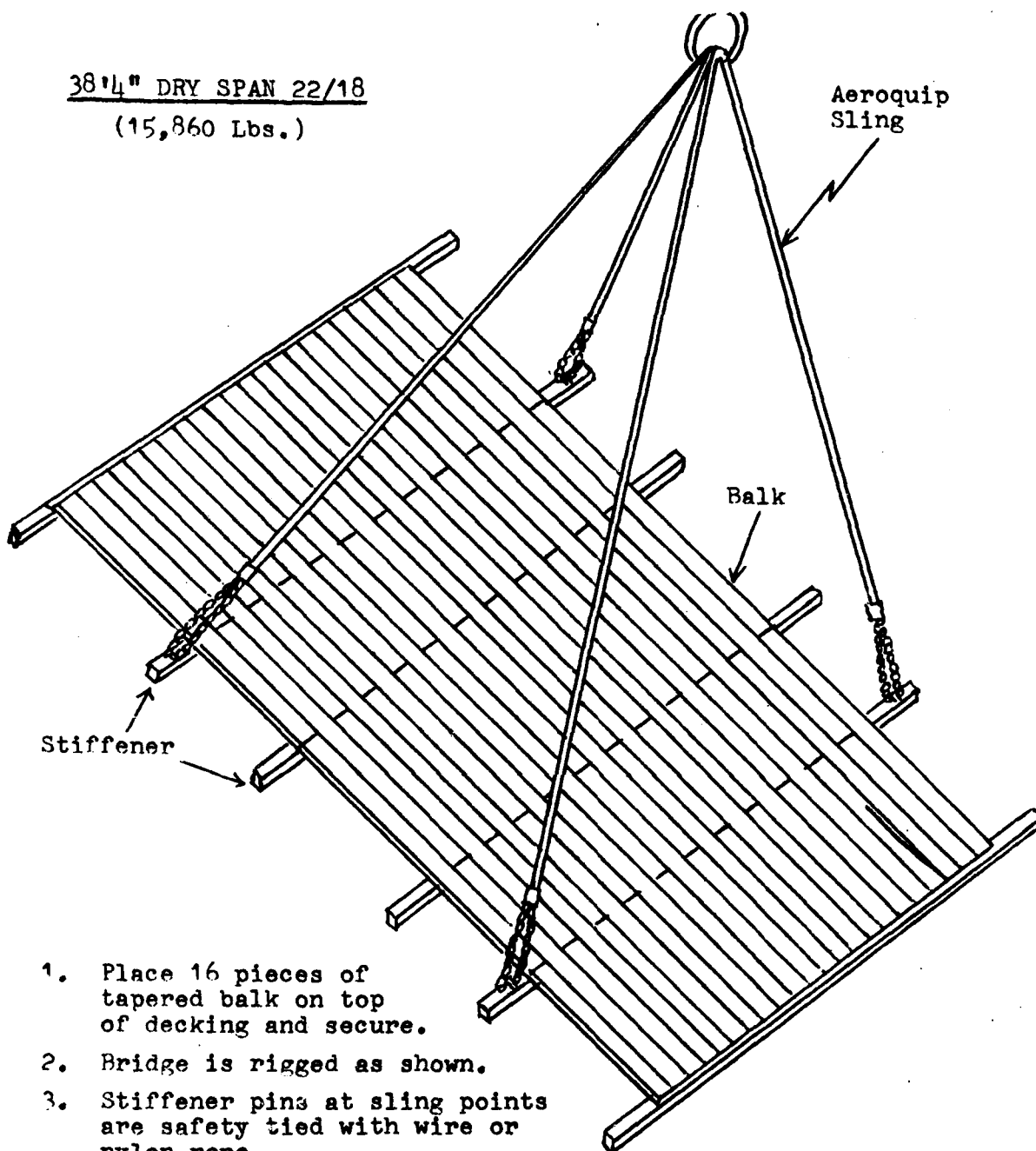
<u>COMPONENTS</u>	<u>QUANTITY</u>
Half Floats	2
Int. Saddle Panel	8
End Saddle Panel	2
Center Saddle Panel	2
End Saddle Beam	4
Outrigger Beam	4
Saddle Adapter	2
Stiffener	2
Curb Adapter	4

H-FRAME 38'4" DRY SPAN (7,856 Lbs.)



<u>NOMENCLATURE</u>	<u>QUANTITY</u>	<u>UNIT WGHT.</u>	<u>TOTAL WGHT.</u>
Stiffener	6	250	1500
Balk (N)	16	225	3600
Balk (S)	8	122	976
Balk (T)	16	100	1600
Curb Adapters	12	15	180
TOTAL			7856

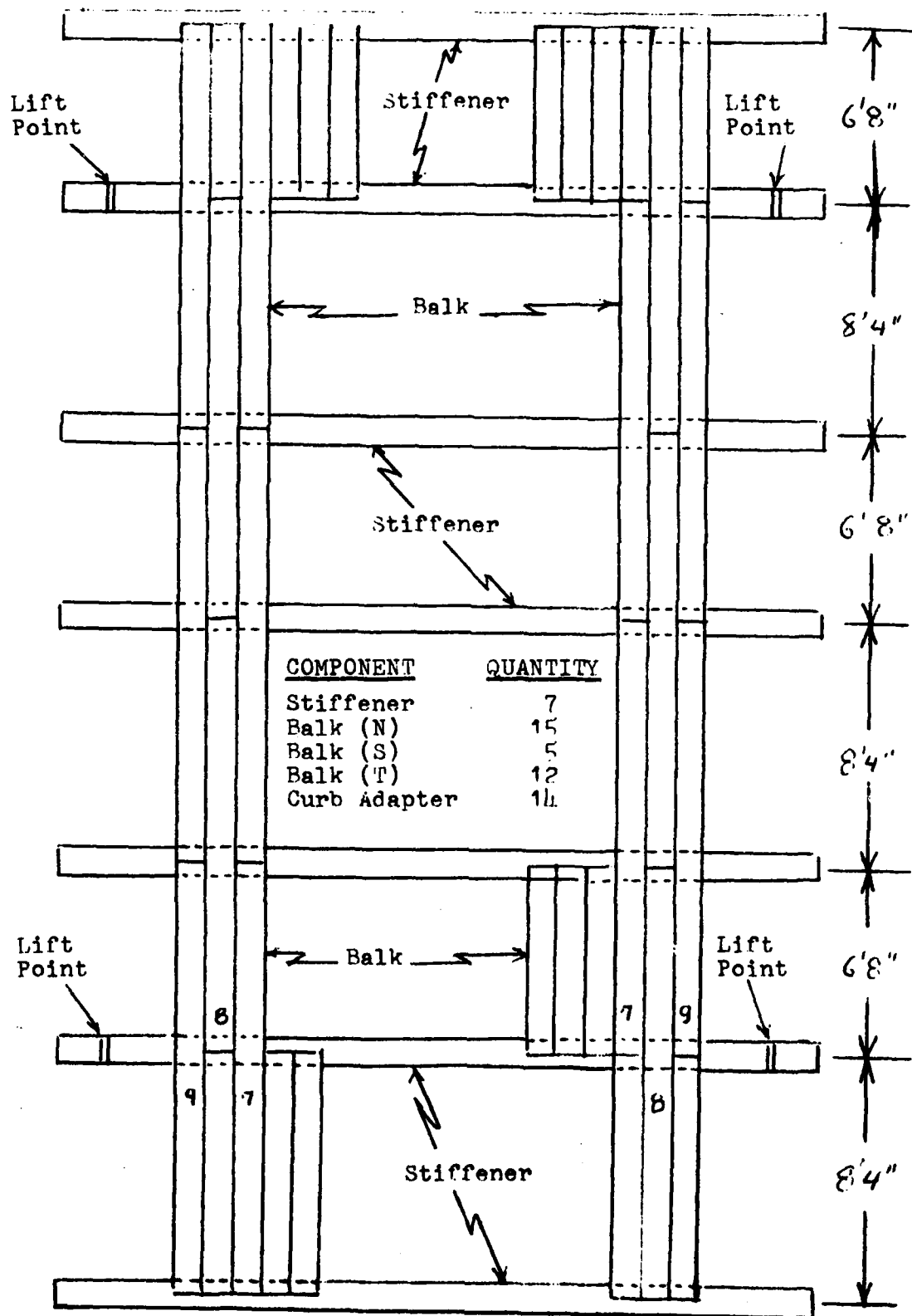
38 1/4" DRY SPAN 22/18
(15,860 Lbs.)



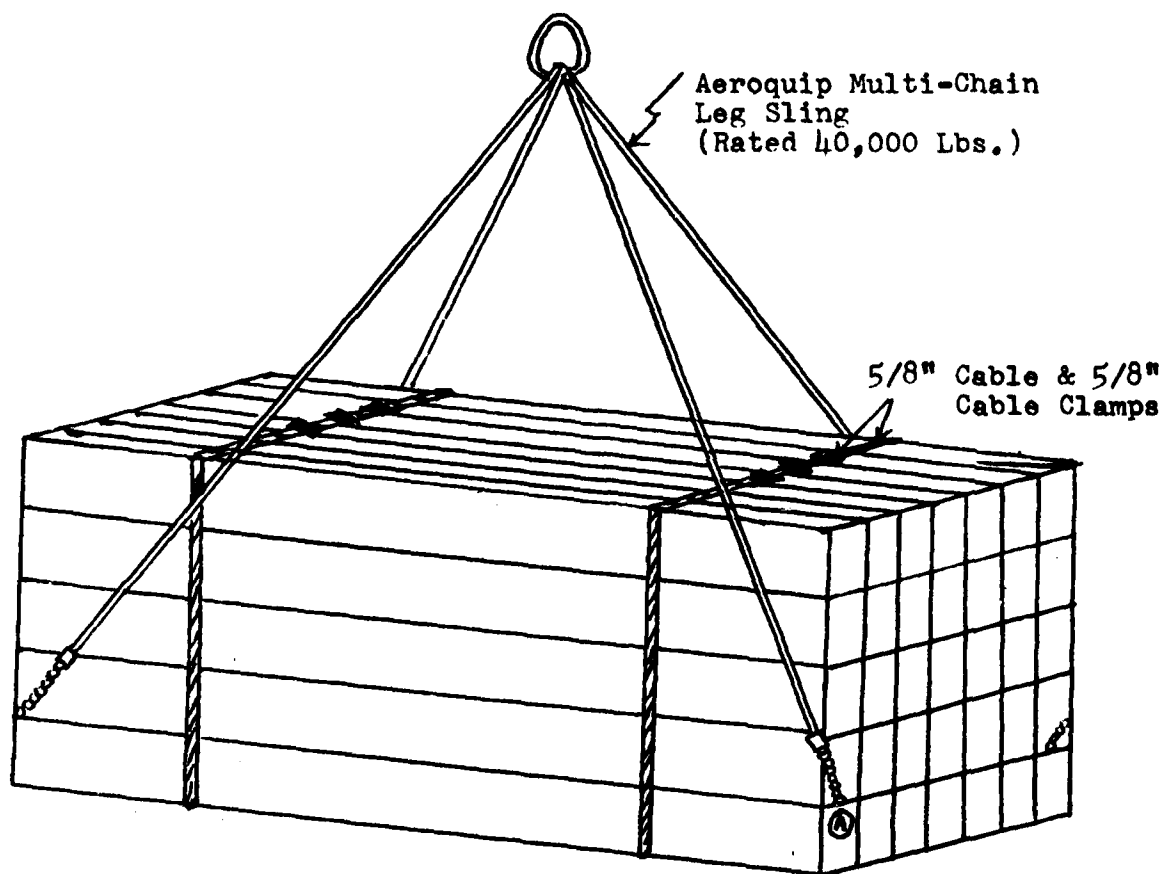
1. Place 16 pieces of tapered balk on top of decking and secure.
2. Bridge is rigged as shown.
3. Stiffener pins at sling points are safety tied with wire or nylon rope.
4. Inspect load and rigging.
5. Load is ready for airlifting.

NOTE: All dry spans are airlifted in this manner. Sling points are in the next to the outside stiffener on each side.

<u>COMPONENTS</u>	<u>QUANTITY</u>
Stiffener	6
Balk (N)	44
Balk (S)	22
Balk (T)	16
Curb Adapter	12



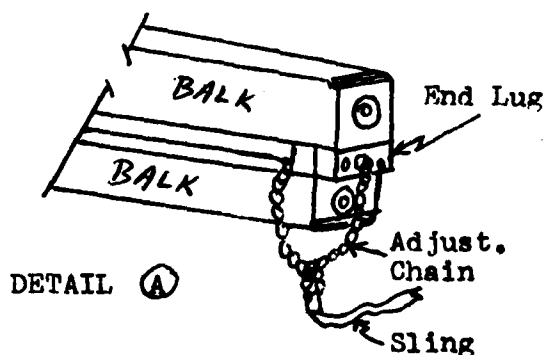
H - FRAME 45' DRY SPAN (7,150 Lbs.)



BALK LOAD - 35 PCS - NORMAL BALK
(7,875 Lbs.)

1. Balk is stacked as shown.
2. Balk is secured in a compact bundle with two 5/8" cables. Cables should be sufficiently tightened, to hold bundle together.
3. Load is rigged in each corner as shown in detail (A)
4. Sling is padded wherever it comes in contact with metal.
5. Load is checked for proper rigging and configuration.
6. Load is ready for airlift.

NOTE: All other Balk Loads are rigged in this manner.
(See Detail (A))

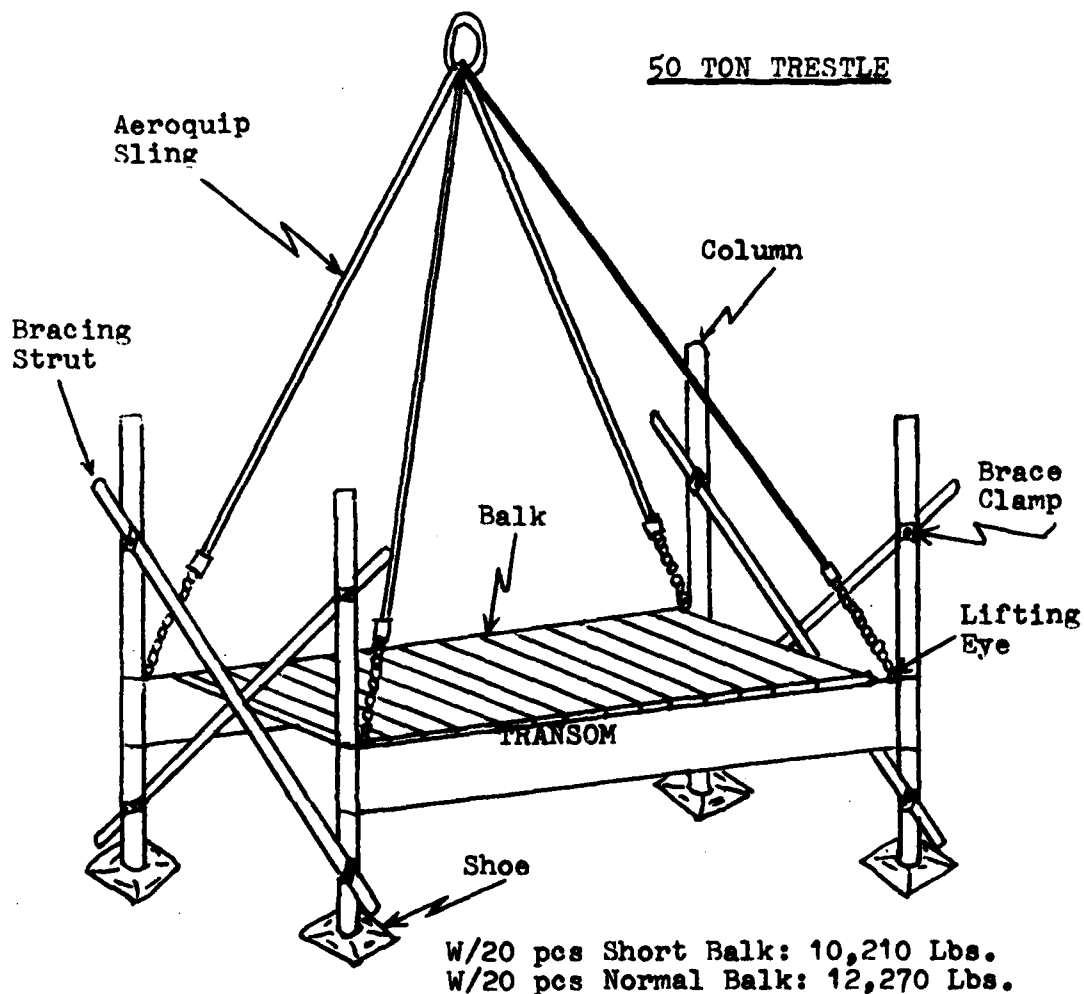


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2	2	2	2	2
5	5	7	2	2
5	5	7	7	2
5	5	7	2	2
2	2	2	2	2

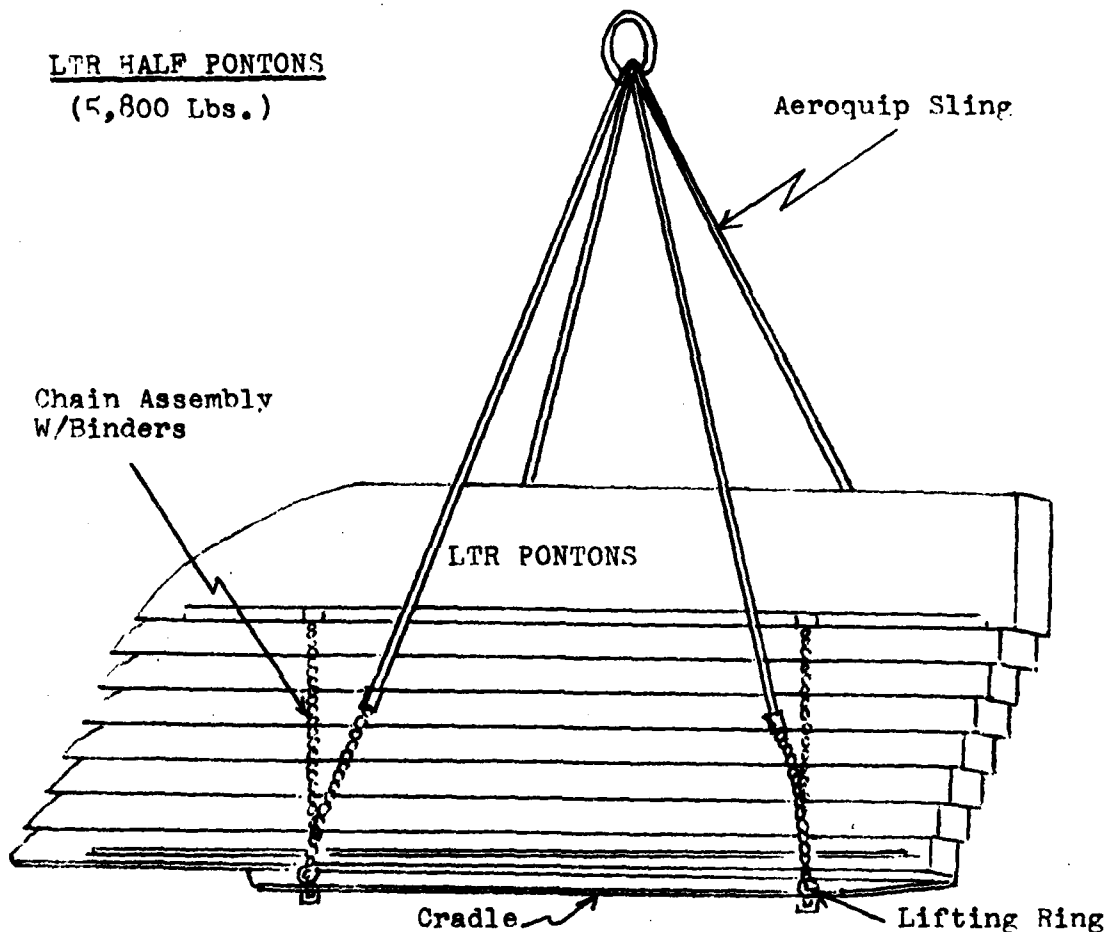
<u>NOMENCLATURE</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>WGHT.</u>	<u>TOTAL</u>
Balk (N)	15	225	3375	
Balk (S)	12	122	1464	
Balk (T)	15	100	1500	
				<u>TOTAL</u>
				6439 lbs.

NOTE: See Annex G for Rigging Configuration.



1. Rigging of trestle as shown.
2. Four additional bracing struts and clamps are secured one to each column.
3. Inspect load for rigging.
4. Load is ready for airlifting.

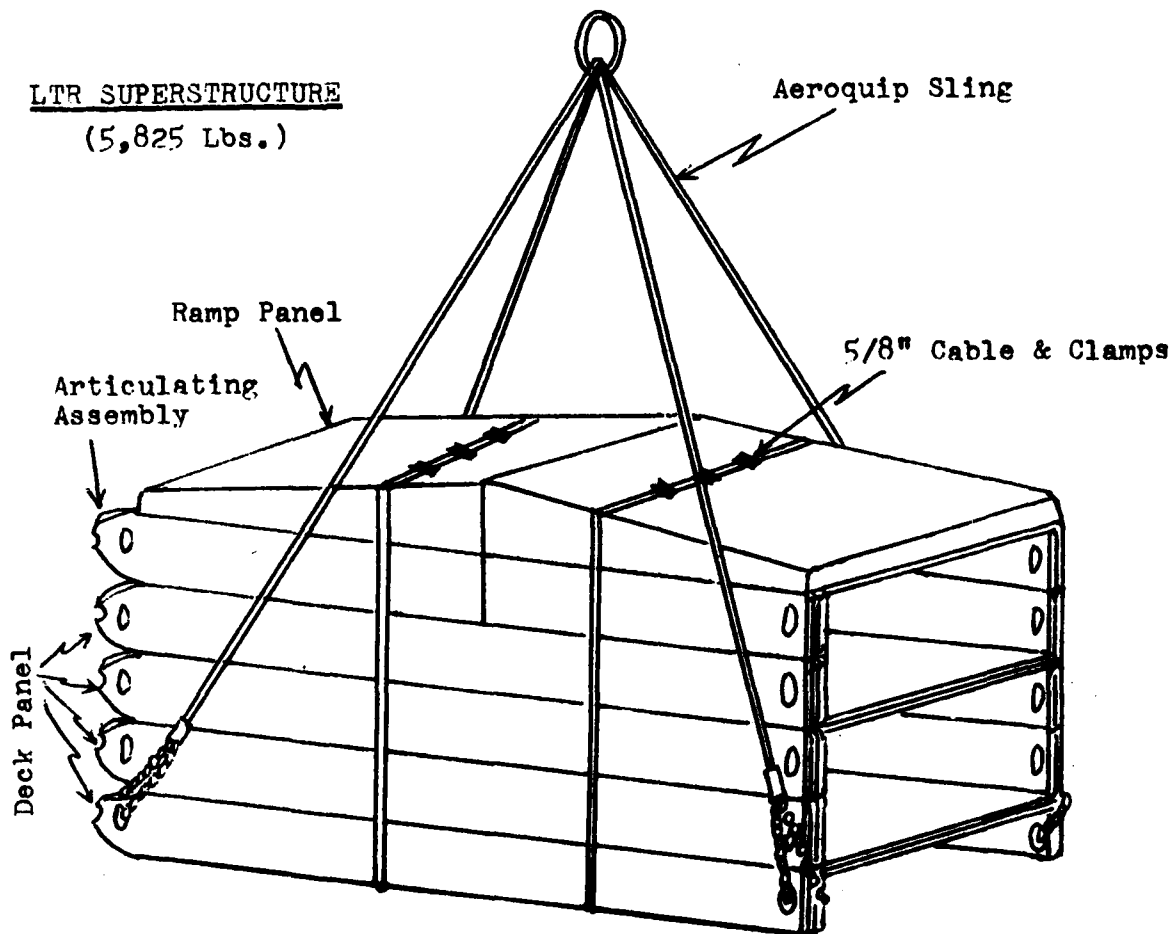
<u>COMPONENTS</u>	<u>QUANTITY</u>
Transom	2
Column, Full	4
Trestle Shoe	4
Chain Hoist Brkt	4
Bracing Struts	8
Bracing Clamps	12
Hold Fast	4
Balk	20



1. Stack half pontons as indicated.
2. Secure stack with chain assembly and binders.
3. Pass adjustable chain leg through the lifting ring and adjust to desired length.
4. Pad sling where necessary to avoid nylon to metal contact.
5. Inspect load for proper rigging.
6. Load is ready for airlifting.

LTR SUPERSTRUCTURE

(5,825 Lbs.)



1. Four Deck Panels, Two Articulating Assembly & Two Ramp Panels are stacked as shown.
2. 4 Filler Panels & Curbing (4 Long, 3 Short) are cradled between the deck panels and secured on both ends.
3. Stack is secured with two 5/8" cables.
4. Load is rigged as shown.
5. Sling is padded where necessary.
6. Load is inspected for proper stacking and rigging.
7. Load is ready for airlift.

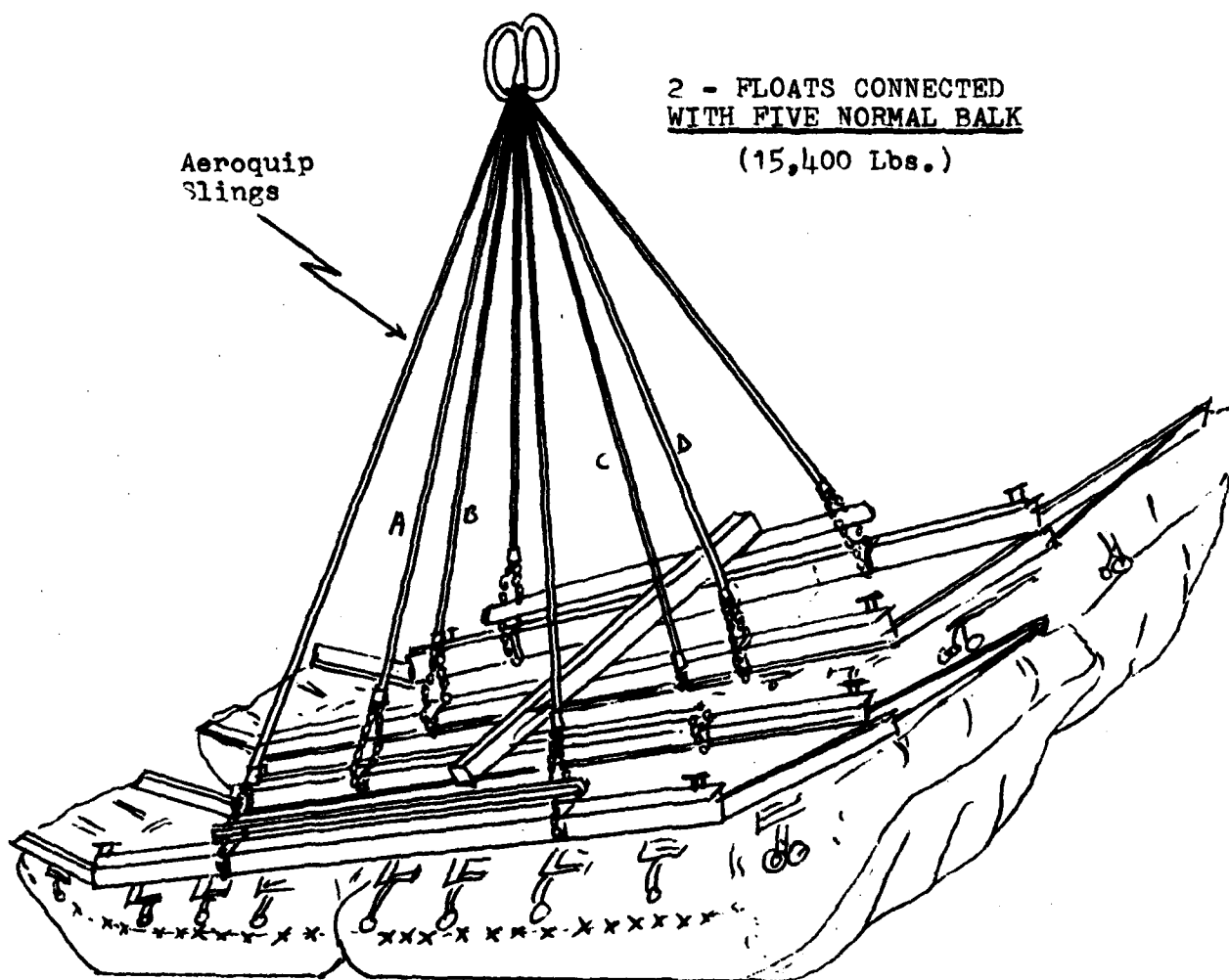
<u>COMPONENTS</u>	<u>QUANTITY</u>
Deck Panel	4
Art. Assembly	2
Ramp Panel	2
Deck Filler Panel	4
Ramp " "	3
Long Curbs	4
Short Curbs	3

[illegible]

2	2	2	2
5	2	2	2
5	7	2	2
5	7	2	2
5	2	2	2
2	2	2	2

<u>NOMENCLATURE</u>	<u>QUANTITY</u>	<u>UNIT WGT.</u>	<u>TOTAL WGT.</u>
Balk (N)	18	225	4050
Balk (S)	8	122	976
Balk (T)	8	100	800
			<hr/>
		TOTAL	5826 Lbs.

NOTE: See Annex G for Rigging Configuration.



1. Sling load as shown.
2. Sling legs A,B,C, & D are shortened and adjusted to compensate for angle difference.
3. Inspect for proper rigging.
4. Load is ready for airlift.

NOTE: A metal clevis is also required when airlifting with a CH-54. Hook requires metal to metal contact.

COMPONENTS FOR VARIOUS DRY SPANS (22/18)

NOMENCLATURE	QUANTITY FOR EACH TYPE			
	23'4"	30"	38'4"	45'
Balk Con. Stiff.	4	5	6	7
Balk (N)	22	33	44	55
Balk (S)	22	11	22	11
Balk (T)	16	27	16	27
Curb Adapter	8	10	12	14
Bearing Plate*	4	4	4	4
Short Cover Plate*	4	4	4	4
Long Cover Plate*	4	4	4	4
Total Weight	11510	14030	17020	19540
* Items Omitted For Airlift Opns	1160	1160	1160	1160
AIRLIFT WGHT.	10350	12870	15860	18380

NOTE: See Annexes C-H for rigging configurations.

COMPONENTS FOR MIL6 RABTS

NOMENCLATURE	QUANTITY FOR EACH TYPE				
	4-Float Normal	4-Float Reinforced	5-Float Normal	5-Float Reinforced	6-Float Reinforced
Adapter, Curb	20	20	28	28	32
Adapter, Sadd. (N)	8	4	10	6	4
Adapter, Sadd. Ofc.	-	4	-	4	8
Anchor, Kedge	4	4	5	5	6
Balk (N)	110	110	112	112	136
Balk (S)	-	-	16	16	-
Balk (T)	16	16	-	-	16
Bar, Conn.	12	12	15	15	18
Float, Half	8	8	10	10	12
Raft ramp	8	8	8	8	8
Saddle Assem.	4	4	5	5	6
Stiffener	10	12	12	14	16
No. of CH-L7 Loads	8	8	9	9	11
Total Wght.	58150	58650	68400	68900	81150

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